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The Home User's Guide to Commodore Computing

RUN

Program of the Month
Computerized Calendar

U.S.A. $2.95
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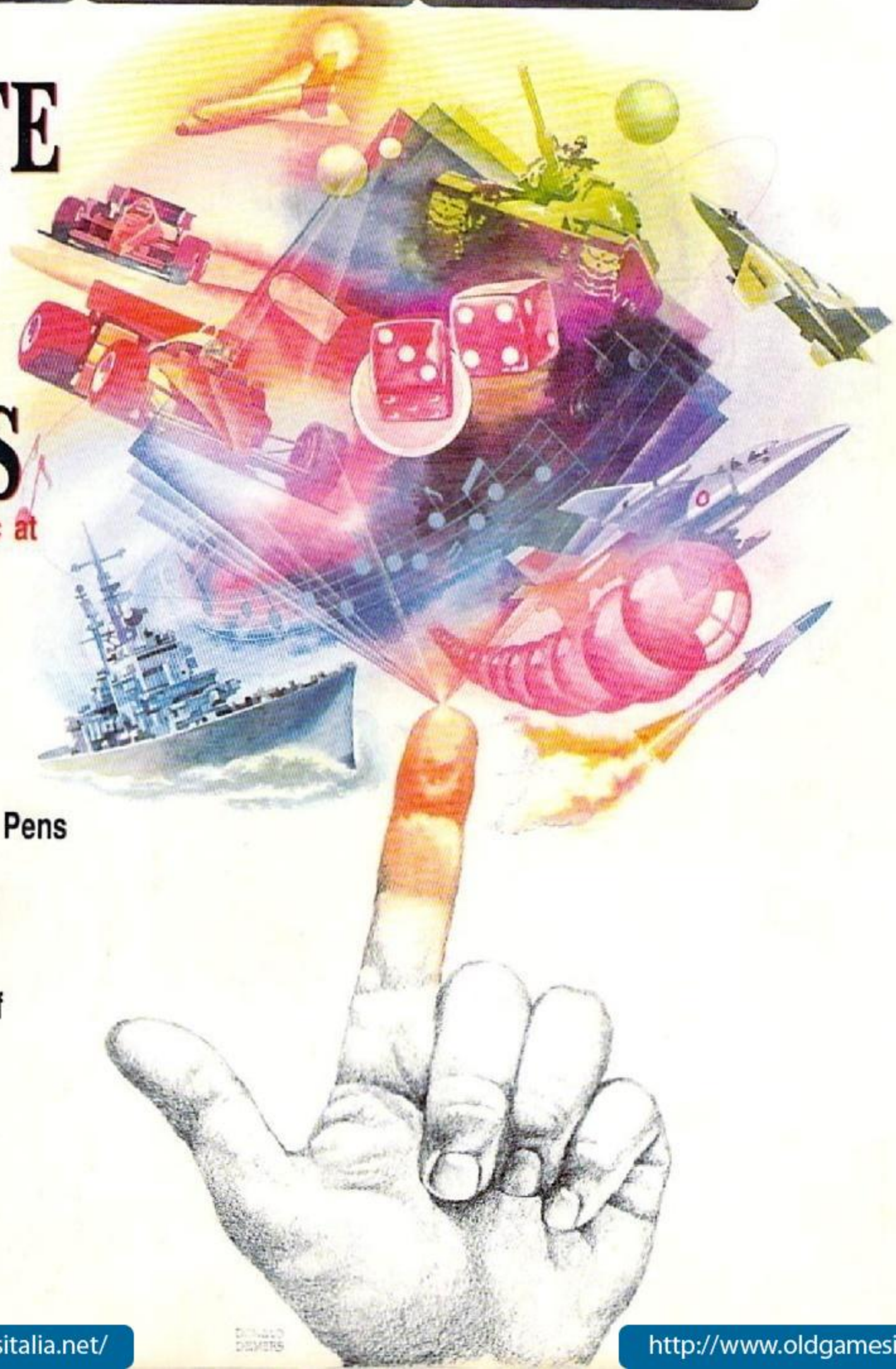
A CWC/I Publication
January 1985

CREATE YOUR OWN GAMES



Programming Magic at Your Fingertips

Let There Be Light Pens

Valuable Disk Tips for Beginners

Avoid the Pitfalls of Printer Shopping

Plus: Commodore's Newest Printer

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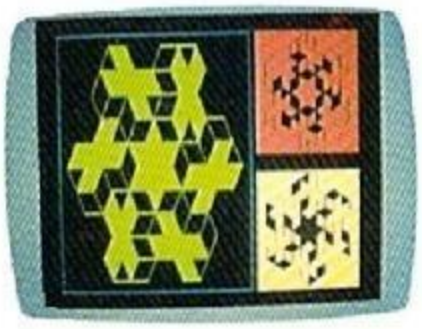

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Quick.

How many plates can the Juggler juggle?

Chinese Juggler

That depends on you. You are the Juggler and your act is the delicate art of plate spinning. Yours will be a tough act to follow if you succeed in matching colors and spinning plates on all 8 poles at the same time.

As your skill increases, so does the pace and the challenge of the game. You must act with speed and precision or the curtain will come down and your act will be all washed up!

Chinese Juggler is a refreshing departure from the usual shoot-em-ups and strategy games. It's fun, fast-paced and will delight players of any age. For Commodore 64. New from Creative Software.

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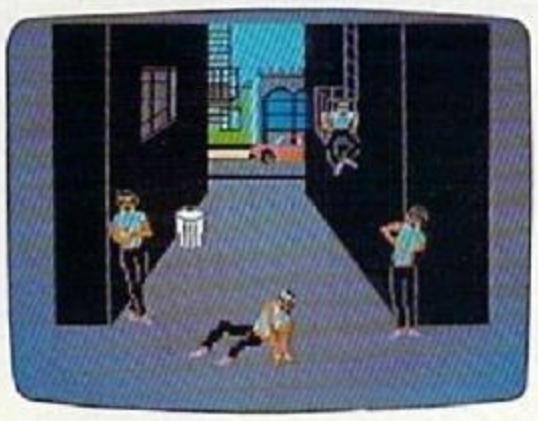
How do you moonwalk, snake and tut?



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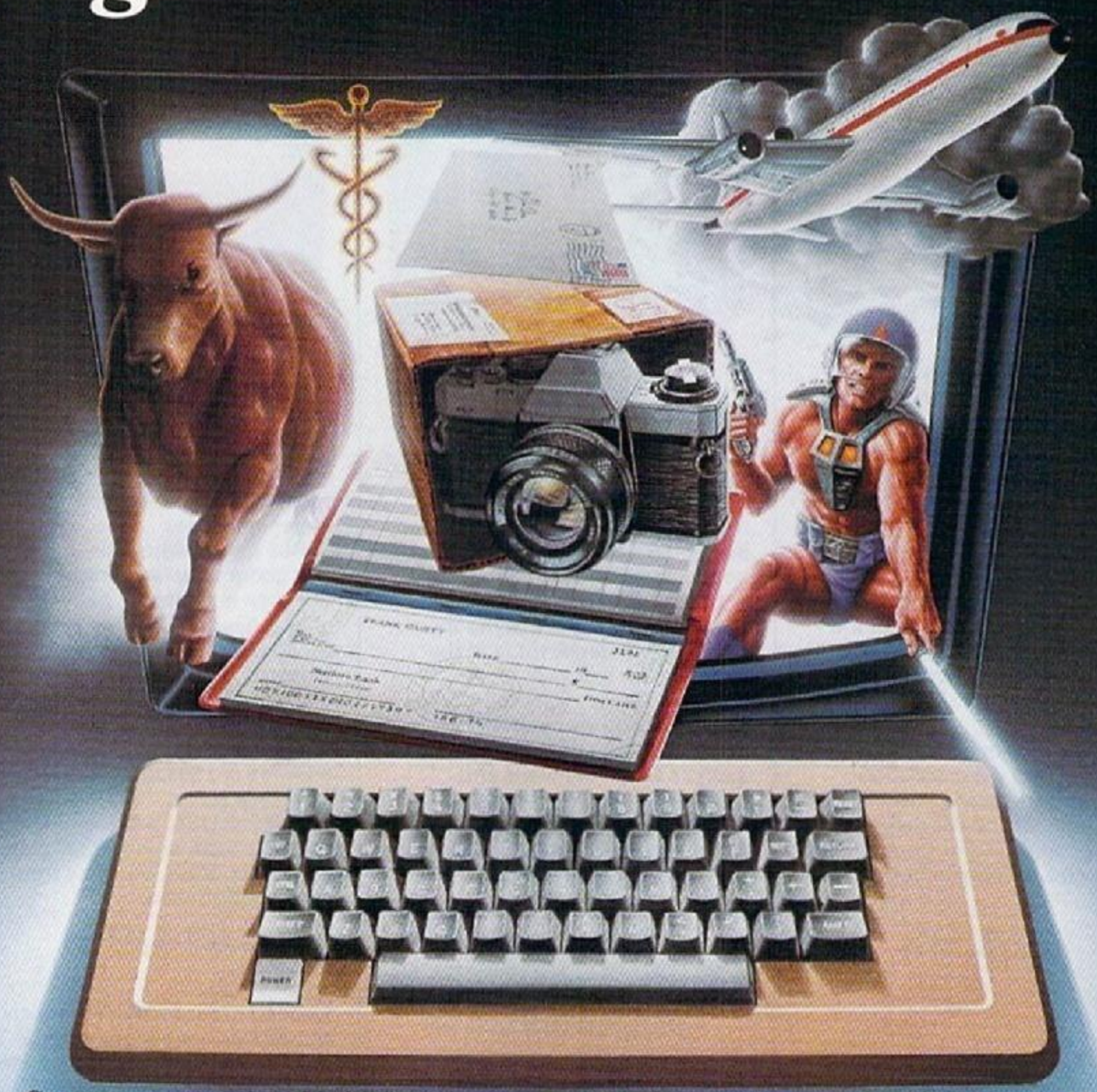

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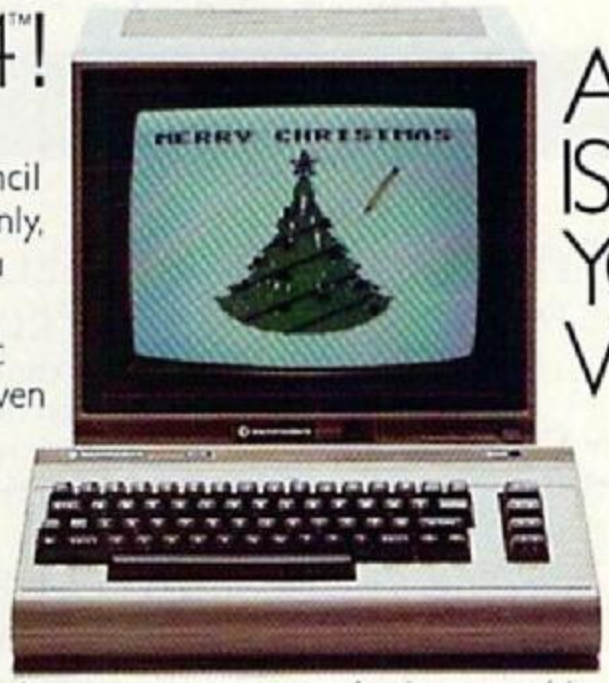

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The Designer's Pencil also lets you program musical compositions to accompany your visual masterpieces.

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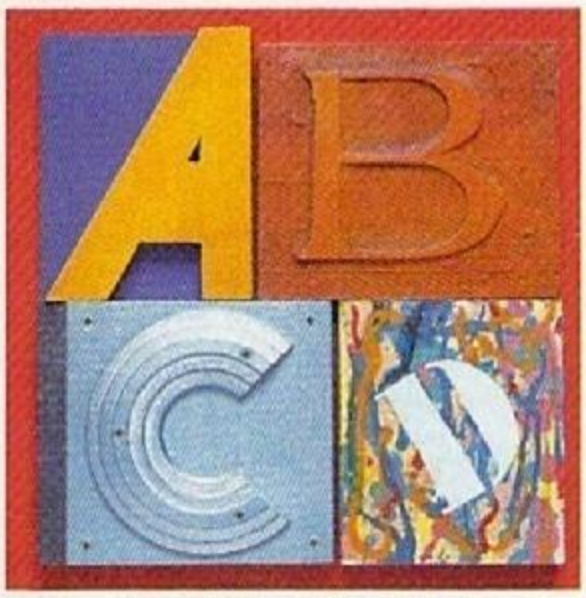

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In This Issue. . .

If you have time to read only one article in this month's issue, I strongly recommend Jim Strasma's "Selecting the Right Printer" on page 56—especially if you're in the market for a new printer.

More and more manufacturers are coming out with printers that will hook up to Commodore computers, and, sometimes, as Strasma says in his article, "making a printer work with your computer can be a real headache if you don't choose the proper printer-interface combination." This article provides some welcome relief with a candid look at some of the more popular models and some of the necessities and accessories that are available.

Of course, there is an alternative to the printer-interface imbroglio. If you purchase a Commodore printer, you won't have to mess with interfaces and switches. And, as luck would have it, the January issue features reviews of Commodore's three latest offerings—the 1526 upgrade, the MPS-803 and the DPS-1011.

Don't be disconcerted by the abstruse abbreviations and model numbers. The former two are low-cost dot-matrix printers, and the latter gives you letter-quality output at a surprisingly affordable price.

This January issue could be a dream come true for those would-be game programmers who have ever dreamed of creating their own games. The series of articles beginning on page 22 will put you into the game-programming mode with valuable tips and game ideas you can add to your repertoire. You'll learn how to create your own word games and maze games and how to add sprite graphics to your arcade-type games.

These articles also offer game ideas you can further develop. Give 'em a try. Who knows, this could be your first step on the road to fame and fortune. . .or at least a great deal of enjoyment.

Are you still undecided about which input device to use? Well, with joysticks, mice and graphics tablets to choose from (evidently, keyboard input has become passé), it's no wonder. Now, there's another one to add to the list—light pens. Discover how these input devices work and what they can do for you.

Also in this issue, we present the perfect way for busy people to start the new year. Take the time now to enter the calendar program on page 48. This program lets you store and display information for those important dates in your life. Now you need never again be late for a meeting or forget that birthday or anniversary.

Articles Wanted

The introduction of Commodore's newest computers—the Plus/4 and the Commodore 16—has opened up a whole new area of Commodore computing. *RUN* is interested in publishing articles and programs for these new computers. If you have developed any programs or applications, *RUN* would like to consider them for possible publication.

We want to know how well-suited the Plus/4 is for its designed marketplace. How easy/difficult is it to use? Do you find the software adequate for your needs? The same questions could apply to the Commodore 16.

In addition, *RUN* would like to hear about any conversions you have made for these machines. Many fine programs have been published in the pages of *RUN*. Can they be adapted to the Plus/4 or C-16? If you have successfully converted such programs for use on your system, why not send them in? We need a printout and the listing on disk or cassette.

How to type listings from *RUN*

Typing in listings can be difficult enough without having to worry about strange graphics characters, charts or tables. That's why we decided to make it easy to enter listings from *RUN* by translating everything we thought might be confusing in any program.

When you see something between the curly brackets, all you have to do is press the keys indicated. For example:

{SHIFT L}—means hold down the shift key and press the L key at the same time.
{COMD J}—means hold down the Commodore key (it is on the lower left side of the keyboard) and press the J key at the same time.
{SHIFT CLR}—hold down the shift key and press the CLR/HOME key.
{HOME}—press the CLR/HOME key without shifting.
{CTRL 6}—hold down the control key and press the 6 key.
{FUNCT 2}—function 2 (in this case, you hold down the shift key and press the function 1 key).
{CRSR UP}{CRSR DN}{CRSR LF}{CRSR RT}—these are the four cursor directions.
{UP ARROW}—means the arrow key (the one with the pi sign under it).
{LB.}—the British pound sign (£).
{PI}—the pi sign key (π); (shift and press the up arrow key).

In some instances, when a large number of characters or spaces are repeated in a listing, we will represent them this way: {22 spaces} or {17 CRSR LFs}.

Print vs Print#

RUN readers should be aware of difficulties that may arise when entering listings that contain the PRINT and PRINT# commands.

These two commands may look very similar, but they are different. If, for example, you use a question mark (?) to abbreviate PRINT in a line such as 10 PRINT#4,A$, then you are signaling to the Commodore computer that you are trying to print the variable #4, which is not a legal variable name.

The command PRINT#4 actually means "print to device number 4." You can abbreviate PRINT# by hitting the P key and the shift and R keys at the same time and then entering the device number. But *do not* abbreviate PRINT# with a question mark.

If you think of PRINT as one command and PRINT# as an entirely different command, then you should have no problems.

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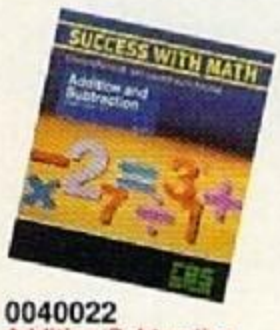

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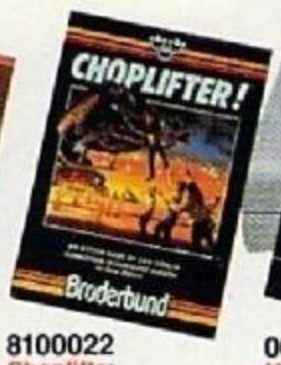
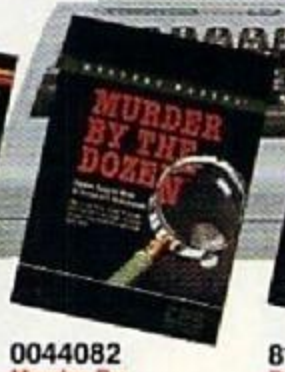


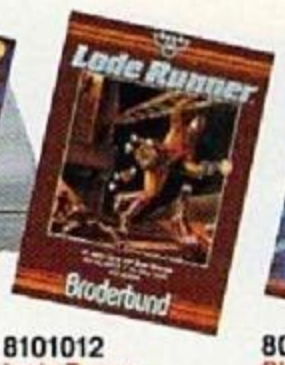
8100022
Choplifter
C-64, Atari H.C.: *disk and cart;* Apple: *disk.*



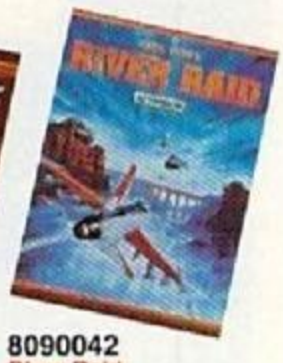
0044082
Murder By The Dozen
C-64, Apple: *disk.*

8123052
Bruce Lee
C-64, Atari H.C. and Apple: *disk.*

8216032
Seastalker
C-64, Atari H.C. and Apple: *disk.*



8101012
Lode Runner
C-64, Atari H.C.: *disk and cart;* Apple: *disk.*



8090042
River Raid
C-64: *disk and cart;* Atari H.C., Adam: *cart.*

8105072
Zork II
Atari H.C. and Apple: *disk.*

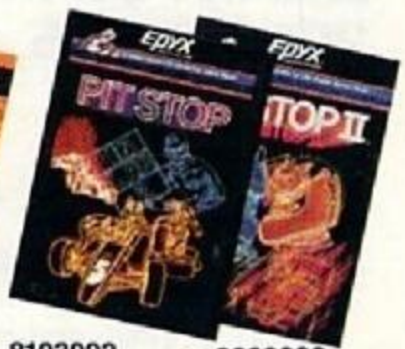
8104082
Zork I
Atari H.C. and Apple: *disk.*

8150012
Summer Games
C-64, Atari H.C. and Apple: *disk.*

8149052
WarGames
Adam: *cart.*

8102002
Temple of Apshai
C-64, Atari H.C. and Apple: *disk.*

8215042
Beach-Head
C-64, Atari H.C.: *disk.*



8103092
Pitstop
C-64, Atari H.C.: *cart.*

8229082
Pitstop II
C-64, Atari H.C. and Apple: *disk.*

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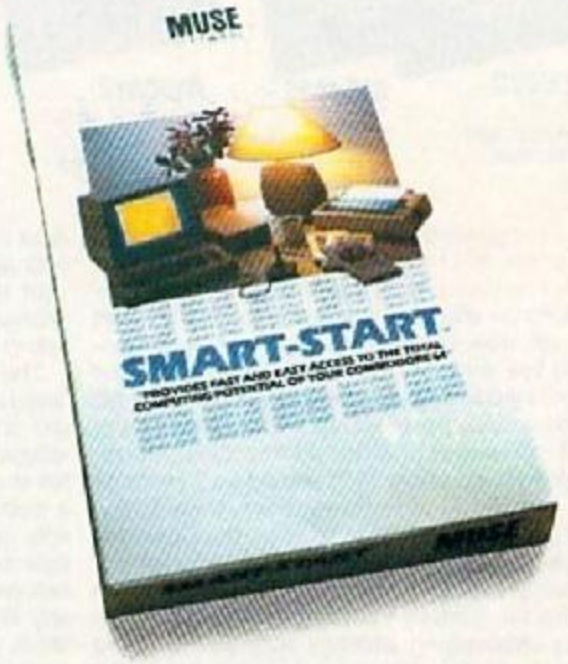

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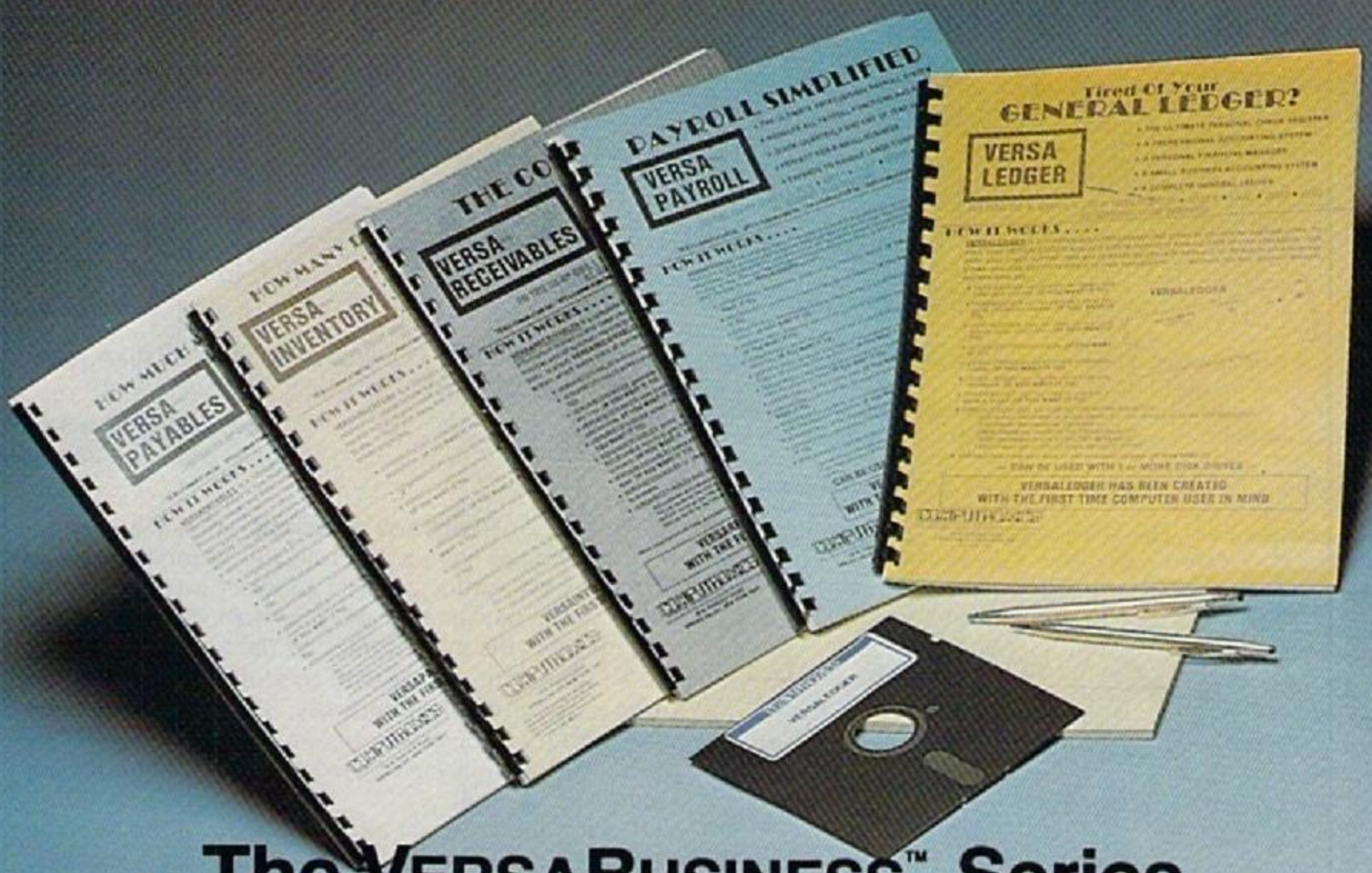

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MAGIC

Compiled by LOUIS F. SANDER

MAGIC is tricks, MAGIC is fun. MAGIC is doing what cannot be done.

MAGIC is a monthly column of hints, tricks and odds and ends from the worlds of software, hardware and applications.

Every month, MAGIC brings you brief and useful computer tricks from around the world—tricks that others have found to make computing easier, more enjoyable or more exciting.

MAGIC features simple hardware ideas, one-line programs, useful programming techniques, little-known computer facts and similar items of interest. We look for new or recycled material that is of current value to Commodore computerists and that can be implemented with a minimum of time, effort, or theoretical knowledge.

Send your own tricks to:

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If you send a self-addressed stamped envelope to the above address, you'll receive a Trick Writer's Guide.

RUN will pay up to $50 for each original trick we print.

MAGIC's tricks are numbered in hex, the number system of sorcery and computers.

At the time of last summer's solstice, a transcendental task force began a worldwide quest. Nymphs and nixies, banshees and brownies, swimming, flying, and riding the bus, scoured the Earth from pole to pole. Their mission: to find the finest tricks for this, your New Year's Magic.

On every continent, these thaumaturgical travelers found crowds of Commodore computerists clamoring to contribute their conjurings. Addis Ababa was ababble; Greece and Guam were agog; all with the urge to share their strongest sorcery. In the end, the best from sixteen countries, from Argentina to Uruguay, were chosen for this issue. As you work these tricks and add them to your bag, consider this literal truth: The power of your Magic extends to the ends of the Earth!

$166 Reclaiming erased programs

—If you accidentally erase a program from memory when using the New command, there's an easy way to reenter it without retyping. Just move your cursor onto any part of the first line, then press the return key. Repeat the process for the other lines on the screen (except for NEW), and your program will be reclaimed (prove the fact by listing the program). The trick works well for the short programs that beginners practice on, since many of them can be listed in less than a whole screen.

Douglas Shepherd
Addis Ababa, Ethiopia

$167 Program subsets

—If you want to extract a few lines from a program (for example, a sound or scoring subroutine), there's an easier way than by deleting all the unwanted lines. The method is to load the program, list the desired lines on the screen, then enter NEW. Move your cursor onto each of the lines you want to save, and press the return key. This will put the lines into memory as a new program, which can easily be saved. The method can be used to save lines that are not contiguous, as well.

If you want to extract more lines than can be listed on the screen at one time, just go through the procedure more than once, saving each segment with a different name. Then merge all the segments together, using the following procedure.

- Load and List segment #1.
- Load segment #2.
- Put your cursor on each of the listed lines from segment #1, pressing the return key on each line.
- Save the combined segments, and repeat as necessary.

Ian Hayes
Westville, South Africa

$168 Sorcerer's handbook

—If you're a fan of Magic, you must get a copy of *RUN*'s special extra issue, advertised elsewhere in the magazine. It has 60 pages of Magic, including every trick published in 1984, plus over 150 new ones. The tricks are organized by topic, and a comprehensive index is included. We've tried to make this the best computer book ever printed, and rumor has it we've succeeded.

The Editors

$169 Trace utility

—The accompanying program traces the execution of any Basic program, a procedure which can dramatically ease debugging. As printed, Trace is for the C-64. For the VIC, change 189 to 221 in line 840. After you've typed in the program, enter in Direct mode:

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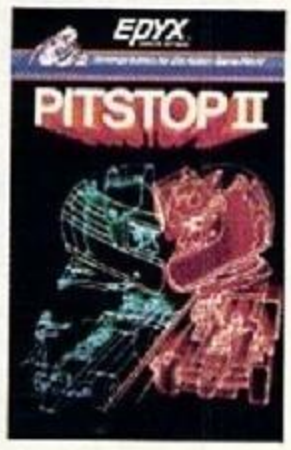
A split screen shows you your position and that of your opponent, a digital clock displays time and a lap counter gives you your race position as you race against each other in pursuit of the checkered flag. You can also play against the computer or take a few practice laps as you prepare for the real head-to-head competition. Step up to PITSTOP II because auto racing is not a solo sport.

One or two players: joystick controlled; disk or cassette.



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```
FOR X=1 TO 54 : READ Y : Z=Z+Y : NEXT : PRINT Z
```

The computer should print 6341 for the C-64 version; 6373 for the VIC. Any other number means there's an error in your Data statements. Once the proper number is printed, save Trace on disk or tape.

Running Trace puts a machine language program into memory, and displays its controlling SYS commands on the screen. You should record these commands for future reference. Type SYSxxx[return], where xxx is the appropriate number from the screen display, to either enable or disable the tracing function. While enabled, Trace will print the line number of each Basic statement as it is executed. To trace a program, first load and run Trace. Then load a Basic program, enable Trace, and run the Basic. Tracing the following test program will give you a good understanding of Trace's workings.

```
10 PRINT "A" : PRINT "B" : X=5 : Y=6
20 PRINT "C" : PRINT "D" : Z=7
```

Notice how four statements are traced in line 10, plus three in line 20.

To get a hardcopy of what you're tracing, add this line at the start of the program being traced:

```
5 OPEN 4,4 : CMD4
```

You can make Trace's SYS calls a part of the traced program, to limit tracing to those parts where it is needed. Try enabling/disabling Trace before/after one of the Print statements in the test program, and you'll see how this feature can be used.

As printed, Trace's machine language resides in the cassette buffer, where any tape activity will overwrite it. But the machine language is completely relocatable; to put it in a protected area at the top of memory, add:

```
115 POKE 56,PEEK(56)-1 : CLR : S=5+PEEK(56)*256
```

Stanley Tobojka
New Bedford, MA

```
100 PRINT"{SHFT CLR}TRACE UTILITY -
    MAGIC{CRSR DN}"
110 S=828: REM RELOCATABLE START ADDR
120 FORX=S TO S+53:READ Y:POKEX,Y:NEXT
130 PRINT"SYS";S+22;"ENABLES,"
140 PRINT"SYS";S+43;"KILLS."
828 DATA 165,058,201,255,240,013
834 DATA 169,060,032,210,255,032
840 DATA 201,189,169,062,032,210
846 DATA 255,108,251,000,173,008
852 DATA 003,133,251,173,009,003
858 DATA 133,252,169,060,141,008
864 DATA 003,169,003,141,009,003
870 DATA 096,165,251,141,008,003
876 DATA 165,252,141,009,003,096
```

$16A Direct tape reading—When a program using cassette files is troubled with errors, it often helps to see what is recorded on the tape. This routine will display the data:

```
10 OPEN 1
20 GET #1,A$
30 PRINT A$; : GOTO20
```

To verify what is being written on the tape, use OPEN x,3,1 instead of OPEN x,1,1. This will output the data to the screen instead of the cassette. In either case, use the CTRL key to slow down the listing.

Max W. Kuypers
Haugesund, Norway

$16B Debugging hint—When debugging a program with a lot of variables, I find it helpful to "echo print" the variables. This is done by putting a Print statement in the program each time a variable is defined or updated. For example, to echo print the variable A, I enter:

```
160 A=INT(RND(0)*10) : PRINT A
```

When debugging a program like this, it's easy to find where a variable is going astray, since each value is printed as the program is run.

James Ryan
Winthrop, MA

$16C Speech synthesis—If you have a speech synthesizer, it can make Data statement debugging much easier. For example, here's how your program might read data:

```
10 FOR T=0 TO 62 : READ Q : POKE 832+T,Q : NEXT
```

The speech synthesizer will pronounce the numbers in your Data statements if you change this statement to:

```
10 FOR T=0 TO 62 : READ Q$ : FOR D=1 TO 500 : NEXT :
   SPEAK=Q$ : NEXT
```

All you have to do is follow along in the program listing, noting errors when they appear. When you've finished debugging, of course, change your program line back to its original form.

Bryan Jacques
Lyn, Ontario
Canada

$16D Typing tip—Ever lose your place while typing a program from a magazine? Try cutting a piece of colored cellophane (approximately 9 inches long and 2 inches wide). Rub it on the page with the program, to build up static electricity, and it will stick to the page anywhere you slide it! Now use your magic cellophane to keep track of your place on the page. If it starts to slide off, just give it another rub.

Wake Lankard
Kenner, LA

$16E West Indies update—The personal computing craze is slowly arriving in the Caribbean. In the Netherlands Antilles, the Commodore line is sold by

Continued on p. 114.

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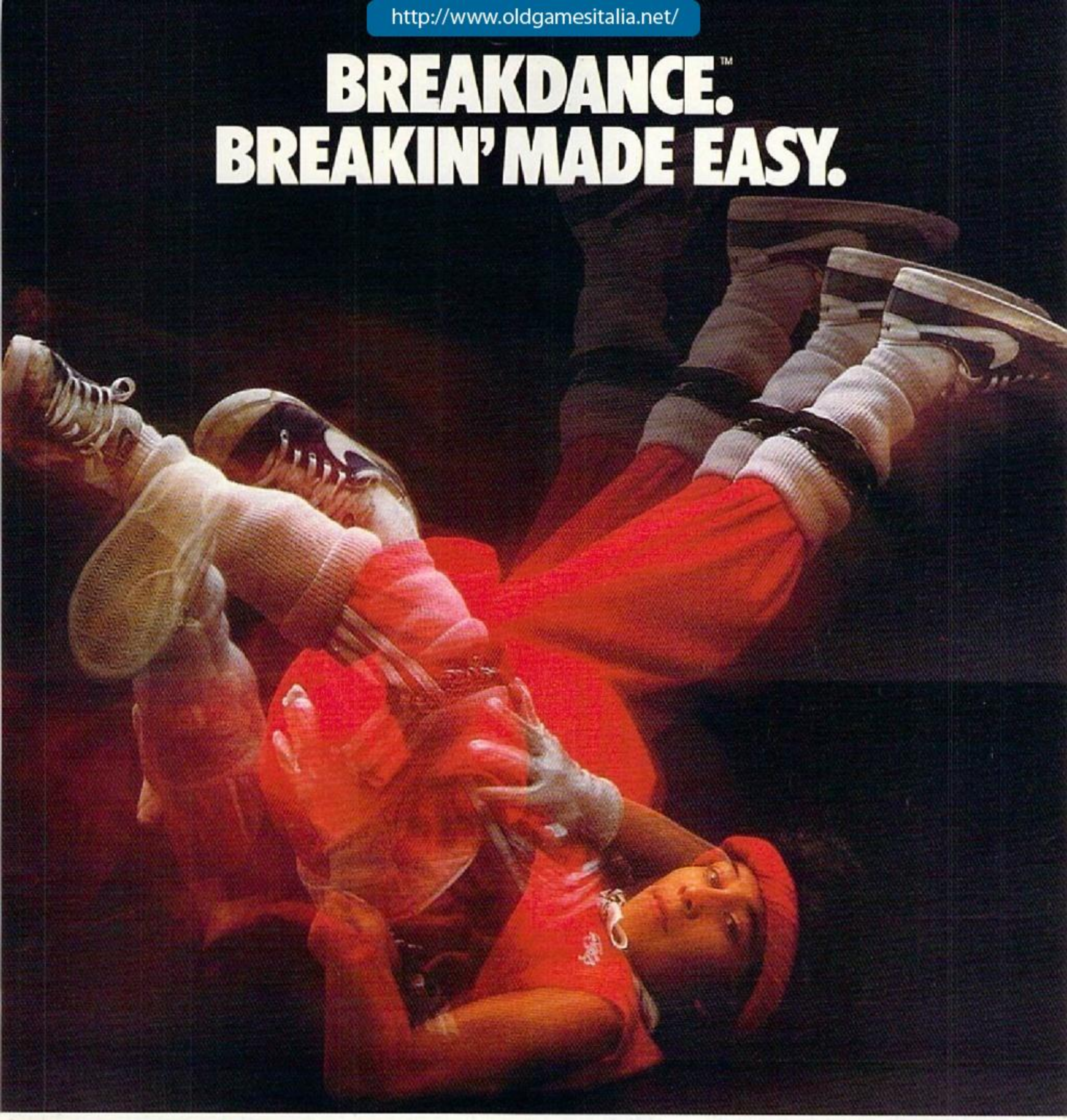

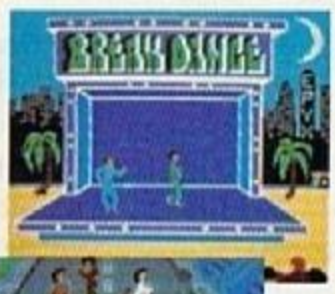

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Breakdance, the game, includes an action game in which your dancer tries to break through a gang of Breakers descending on him, a "simon-like" game where the dancer has to duplicate the steps of the computer-controlled dancer and the free-dance segment where you develop your own dance routines and the computer plays them back for you to see. There's even a game that challenges you to figure out the right sequence of steps to perform a backspin, suicide or other moves without getting "wacked."

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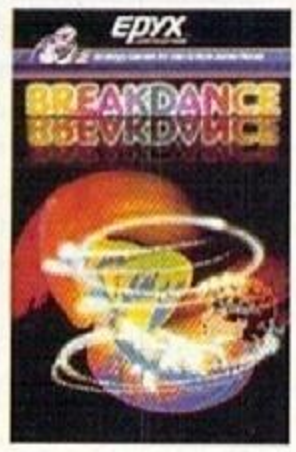

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Compiled by SHAWN LAFLAMME

Questprobe: The Hulk

B

The First Release in a Series of Marvel Comics Adventure Games

What is Questprobe? It's a merging of the minds of Marvel Comics and Commodore Business Machines with the programming talent of Adventure International's Scott Adams, to produce a complicated series of adventure games. Adams has programmed adventure games for years, and Questprobe displays his talent for creating complex thinking games, while keeping them interesting. Commodore 64 users have a choice of a cassette text adventure version of Questprobe, or a disk version with graphics. I reviewed the disk version of Questprobe, because I wanted to comment on both the adventure and graphics of the game.

Each Questprobe game is accompanied by a comic book, which features the classic Marvel characters and explains many things not covered in the games. The comic book tells the story of Durgan the Philosopher, who enlists the aid (by trickery) of the Hulk to save his doomed planet.

The Hulk computer game belongs to the adventure-game genre and begins with Bruce Banner, the Hulk's alter ego, tied to a chair in a mysterious chamber. You must find a way to become the Hulk, and then break free of the chair. Once you've destroyed the chair, you're free to begin your search for 16 gems and one bio gem. This quest will lead you out of the great dome, and into new worlds and dimensions beyond comprehension.

On your adventure, you will run into familiar figures—the villainous Ultron and your friends, Antman and Dr. Strange.

The pictures used in this first Questprobe game were created by Marvel, in the form of pen and ink drawings. Fifty to 70 drawings were produced for the program, using from 100 to 4000 bytes to generate each picture. I was pleased to see the Hulk, Bruce Banner and the guests in this program appearing exactly as they do in Marvel comics. The background scenery in Questprobe is also very artistic.

I've played about ten graphics adventures on two different computers, and Questprobe is one of the best I've played. I was disappointed that there were no sounds in the program, but this game appeals to my love of comics and adventure games. I like the idea of gaining the Hulk's powers and using my own mind to control them.

The problems offered to the player of Questprobe are very well thought out. After all, what do you expect from Scott Adams, the creator of the first microcomputer adventure game? Adams has also surprised a lot of Commodore 64 owners by solving the problem of disk speed. Scott maintains that the disk version of Questprobe runs faster than any other disk program on the market for the C-64.

With a new Questprobe comic and game being issued every three to five months, the series will take years to run its course. The subject of the second Questprobe game will be Spiderman, and it appears that he will encounter his old foes, Mysterio and Doctor Octopus. Allen Milgrom, script writer for many Spiderman stories, is writing the second Questprobe comic. Beyond Spiderman, Scott Adams informs me that the next two Questprobe games will probably feature the Human Torch and Captain America.

Keep following the Questprobe series, because the final game will be played using information acquired from the earlier programs. If the Hulk graphics adventure is a preview of things to come, Questprobe will be a popular subject for a long time. *(Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380.)*

John Jermaine
Taylorville, IL

Report Card

A ***Superb!***
An exceptional program that outshines all others.

B ***Very Good.***
One of the better programs available in its category. A worthy addition to your software library.

C ***Good.***
Lives up to its billing. No hassles, headaches or disappointments here.

D ***Mediocre.***
There are some problems with this program. There are better on the market.

E ***Poor.***
Substandard, with many problems. Should be deepsixed!

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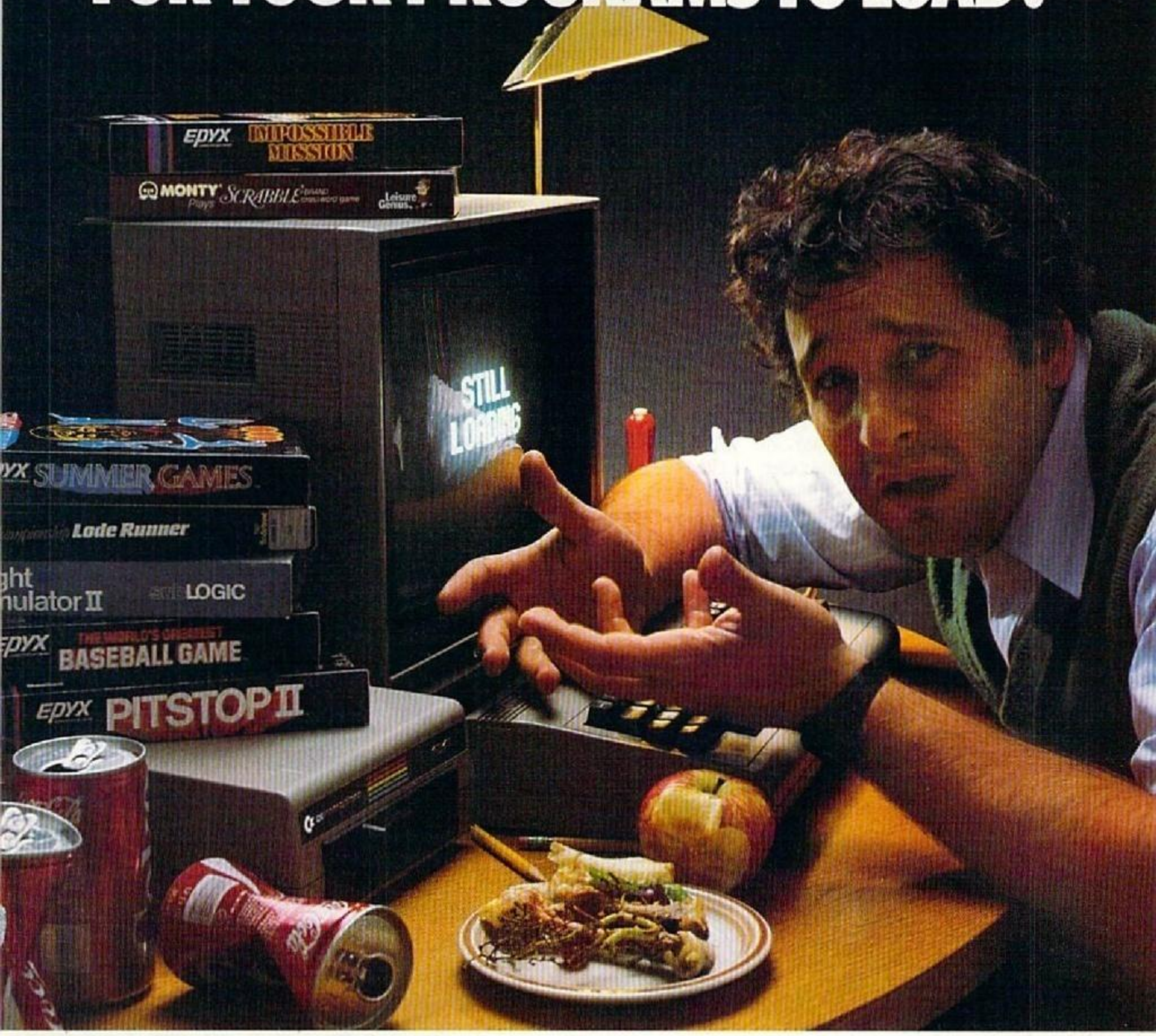

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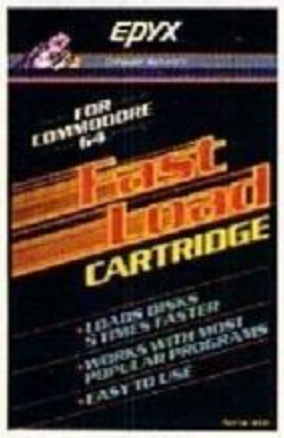

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Kidwriter

A

This Interactive Program Lets Kids Create Their Own Electronic Storybooks

Children love storybooks, with the pictures, bright colors and, of course, the words describing it all. And now your children can use a Commodore 64 to open wide their vivid imaginations, actually creating their own electronic storybooks!

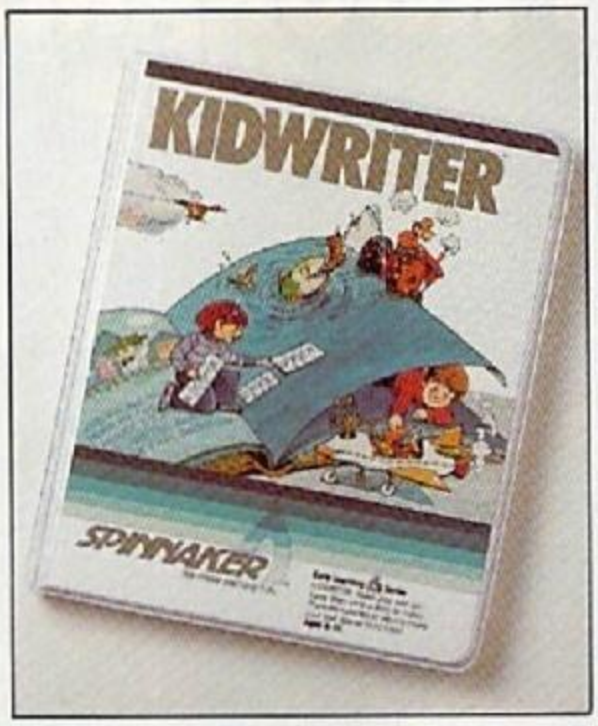
Spinnaker's Kidwriter is a fascinating program for kids in elementary school. (It is also appropriate for smart kindergarten children whose parents don't mind providing some necessary help.) Using Kidwriter, your child can choose from a variety of settings, such as a stage, a starry night, a picture frame and many more.

Selecting from 99 objects (boys, girls, lunar landers, moons, cabooses, etc., as well as the whole alphabet and numbers), the child places those objects where he wants them on the screen. You can also easily change the color or size of the objects. You don't like a white snowman? Be unconventional—make him black or green! Or, you can shrink him down to a shadow of his former self, or puff him up until he's gigantic!

Once your child is completely satisfied with the scene, he'll be ready to write a page of his story. If it's truly great (to your child), it can be saved on the program disk.

Kidwriter starts off with a short demonstration mode of pictures and stories explaining the program. You can continue watching or stop the demo to move on to the story-creation part. When your child is ready to create, pressing the B key will bring him back to the story-making program. Choices on the next menu allow the child to make a new picture-story, load an old one or call up a directory of picture-stories. The program uses simple, logical menus, taking the child every step of the way, without sacrificing creativity or spontaneity.

A new menu appears on the bottom half of the screen for creating a new picture-story. To set the scene, the child will press S until a satisfactory scene appears. (The scene can be changed later, if desired.) Next, people, animals, letters or numbers can be chosen. Let's see, do you want that little boy? No? Then press F, for forward to the next object. You accidentally skipped past a cute little duck? No problem. Go backwards with a press of the B key. Now you have the duck on your lower screen, and you want to set him on your stage scene. Press P, for pick, as the bottom half of the screen explains. Move your little duck in place with the arrow keys. Now you can move on to the next object with a press of the N key.



Once your child has set the scene with enough colorful characters, he's ready to write a page of his story. (Several sentences are allowed per page.) For typographical errors, Kidwriter has simple editing capabilities; you can go backward and correct, or you can erase the whole thing if you wish, using simple commands. Don't worry about words being broken at the end of a line—the program automatically wraps words on to the next line.

After writing the page, the child can press the asterisk key to tell the computer he's done, as the menu explains. Then your child can sit back and enjoy his story, accompanied by something you won't get in conventional storybooks—music!

Saving the story on disk is a simple task. You don't even need another disk to do it—just save the story right on your program disk. The computer asks if you would like to save this page of your story. Press Y, for "yes," and the computer will ask you to give a name to the story (no more than 12 letters long). Voila! The story is saved for posterity! Later on, if you've forgotten the name of the story, you can simply call up the Directory to refresh your memory, and then load the story you want.

Any problems? Preschoolers would probably find the simple word processing confusing or frustrating, because, of course, you must be able to read in order to write. But, if you buy the program for an older brother or sister, your five- or six-year-old can have a great time with the picture-making part of the program. Kidwriter is intended for children ages 6–10. (I'd move it up to ages 7–11.)

What I really wish the programmers could have put in Kidwriter, although I suspect there wasn't enough memory for it, is animation. It would have been interesting to see a purple flower dance across the stage, or an alien sitting on his spaceship, skimming through the universe.

I think Kidwriter is a super program with great potential to inspire budding writers. But don't throw away those beloved storybooks! For a child, nothing can replace the experience of sitting on Mom or Dad's lap and being read to. Use Kidwriter as a supplement. With a combination of traditional storybooks and this electronic storybook, you may be grooming one of America's future writers! *(Spinnaker Software Corp., 215 First St., Cambridge, MA 02142. $34.95.)*

Christine Adamec
Palm Bay, FL

Saucer Attack!

B

Defend Washington, DC, From an Invasion of Flying Saucers

The classic space shoot-'em-up game was one of the first to appear on the microcomputer, and now the people at Sachs Enterprises have brought the playing field down to Earth. In Saucer Attack!, an action-packed disk program for the C-64, you are responsible for protecting Washington, DC, from an invasion of flying saucers.

Saucer Attack! has no instruction booklet. I've grown to expect a booklet (or printing on the package) that explains how a program works, perhaps giving playing tips or a story to support

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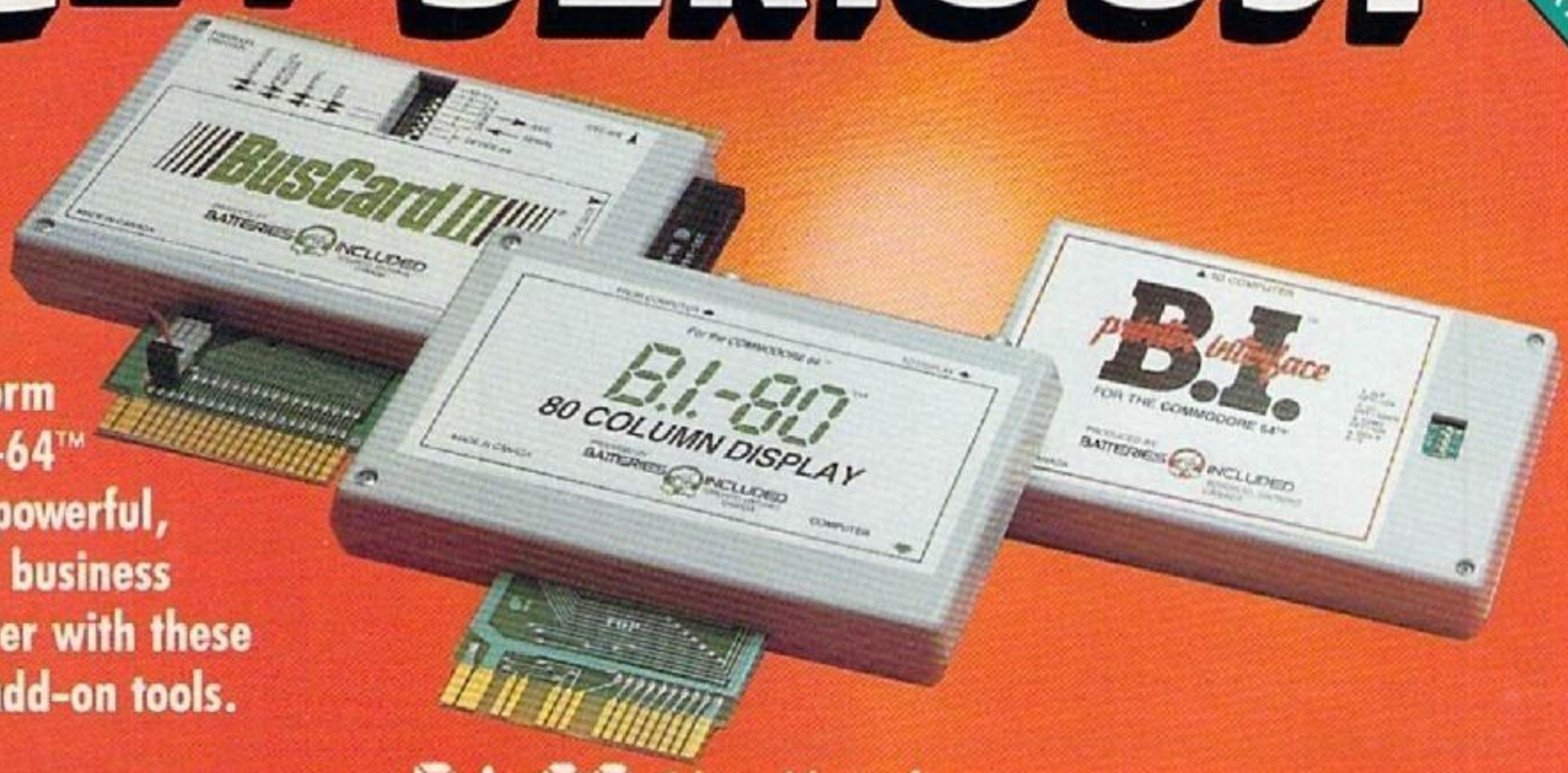

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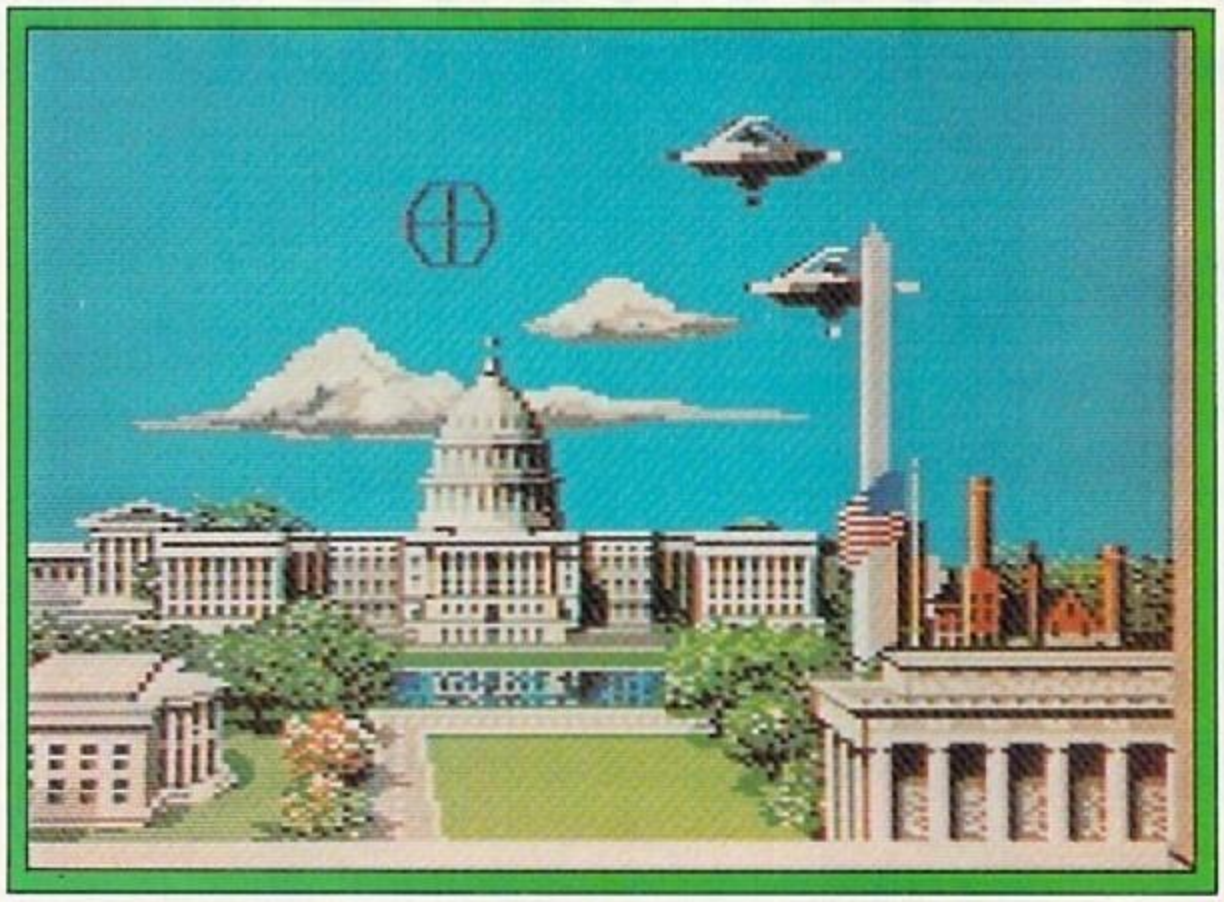

the game. Apparently, the creators of Saucer Attack! saw that their instructions only occupied a paragraph, so they included that information on the disk and saved themselves the printing costs. I'm satisfied with this arrangement, because the game's concept is simple and clear.

To blast flying saucers out of the sky, you must first move the joystick to align your weapon's cross hairs with a target. Pressing the fire-button will lanch an energy ball at your intended victim.

Scoring in Saucer Attack! is fairly complicated, with many factors that can determine the outcome of the game in mere seconds. There are two types of saucers. A saucer that rotates from right to left will stop moving when the fire-button is pressed. If you blast one of these saucers, you will earn one point. Other saucers move continuously—these are worth four points apiece. Saucers lose a point for each point you score in the game. Saucers gain a point whenever you fire at a target and miss it; they also gain a point for every three seconds of play during the game.

If you can manage to earn 50 points, you'll then have to battle the saucers in twilight. After 100 points have been earned, the scene changes to night. Every screen change increases the point value of the enemy saucers, while the speed and agility of the saucers also increases.

As you pass the magic number of 150 points, the final menace is faced—the Mothership. Remember to watch the saucer scoreboard, because an enemy score of 50 points will end the game. The game will also end if a saucer is allowed to land. Be sure to blast any low-flying saucers; this will give you bonus points and keep the game going.

You must also destroy saucers as they approach national monuments, because they will attack the buildings, giving them bonus points. This scoring system is rather confusing, but points can add up on either side very rapidly. Set a steady pace as you play the game, and don't shoot at a target unless you have a really excellent chance of destroying it.

The graphics of Saucer Attack! are incredible. The programmers of the game have created excellent images of the White House, the Capitol Building, the Lincoln Memorial and the Washington Monument. Clouds in the sky look almost as though they are painted onto the screen, while an American flag waves in the breeze. The programmers had such an eye for detail that they included many famous Washington sights, including cherry trees and the pool in front of the Capitol Building.

Creating beautiful, detailed graphics of an existing city is one thing, but artistically depicting the destruction of that city is another. Again, the creators of the program did a fantastic job. The saucers shoot energy bolts at the buildings and monuments, destroying them piecemeal. Each building can be hit by enemy fire several times; more damage is done with each hit. When the game is lost, the city is complelely annihilated by the aliens in a few seconds.

If you destroy the Mothership, the game ends in a festive display, with fireworks and patriotic music. Even the graphics of the saucers are well designed, with interesting colors and details. The graphics of Saucer Attack! appear to have been carefully planned, as well as painstakingly executed. The game is worth buying just to see some of the best graphics that have ever appeared in a C-64 game.

The sounds of Saucer Attack! are also well done. They range from pieces of patriotic music to eerie sound effects, reminiscent of the late 1950s science fiction movies. The saucers' energy bolts make a sizzling noise, while your energy balls sound like gunfire.

The classic sci-fi movie, *Earth vs. the Flying Saucers*, seems to have been the inspiration for the creation of Saucer Attack! In the movie, Washington, DC, is attacked by flying saucers that blast national monuments, using powerful energy bolts. I like the idea of taking the theme of a classic film and expanding it to produce a microcomputer game.

The graphics and sounds of Saucer Attack! are brilliant, showing what a good programmer can do on the Commodore 64. However, I regret that there aren't more than two screens in the program. It would also be preferable to have the game continue at a higher difficulty level after the destruction of the Mothership.

However, don't let these two shortcomings dampen your opinion of Saucer Attack! The game provides plenty of challenge. It is set up to penalize you for any mistake you make. If you fire too often and miss your targets, you'll lose points. What could be a greater challenge to the average arcade addict, who is used to unleashing a barrage of shots at anything that moves?

Saucer Attack! will capture your interest, challenge you and dazzle your senses! *(Sachs Enterprises, PO Box 1182, Lake Arrowhead, CA 92352. $29.50.)*

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Taylorville, IL

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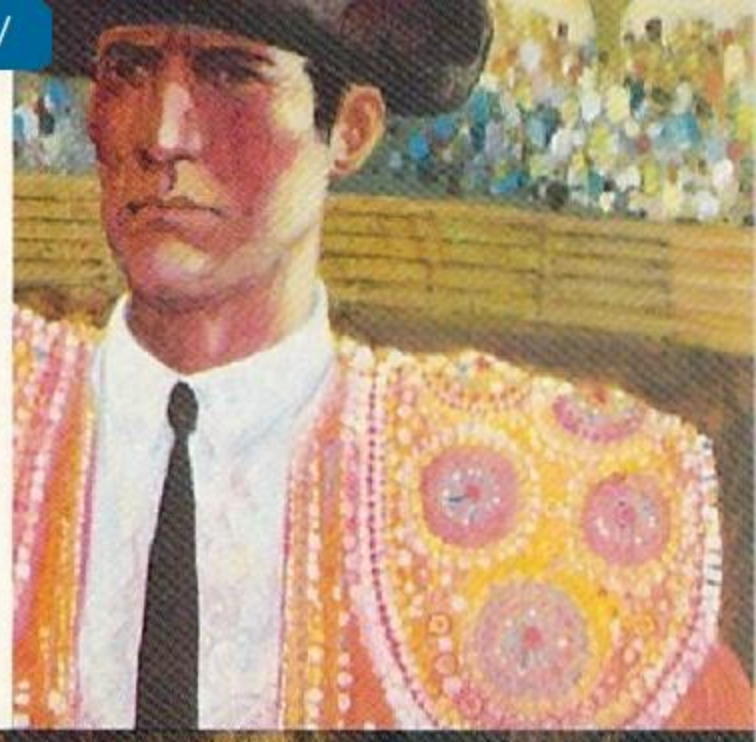

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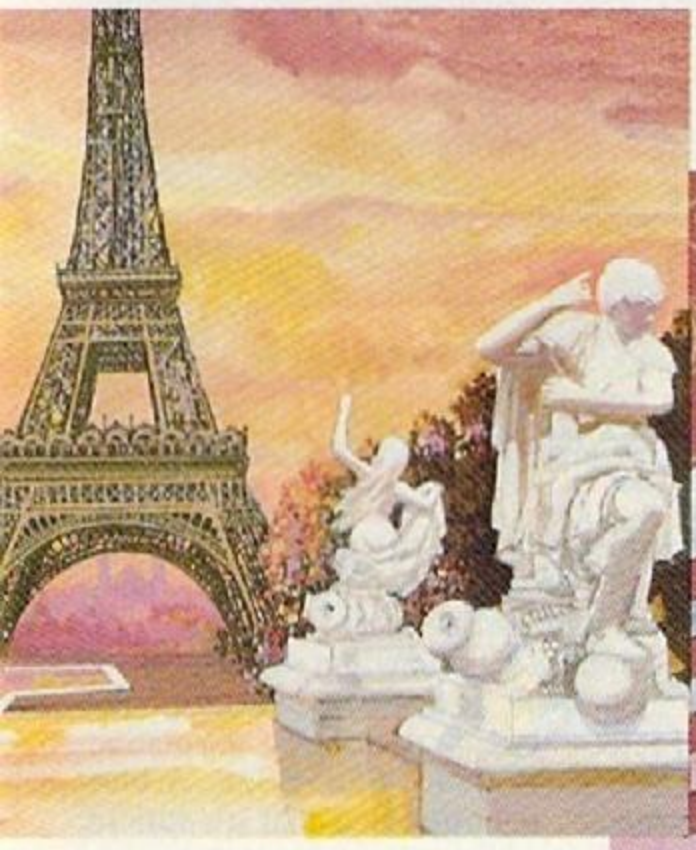

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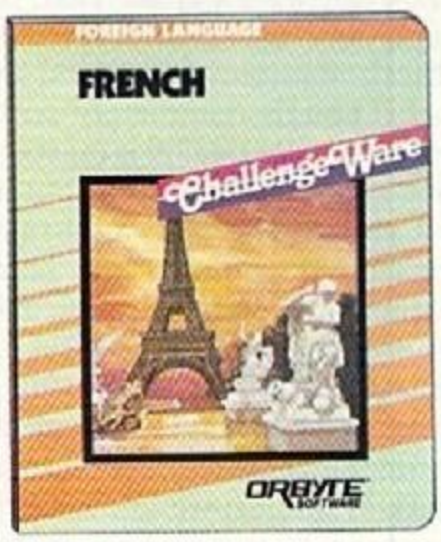

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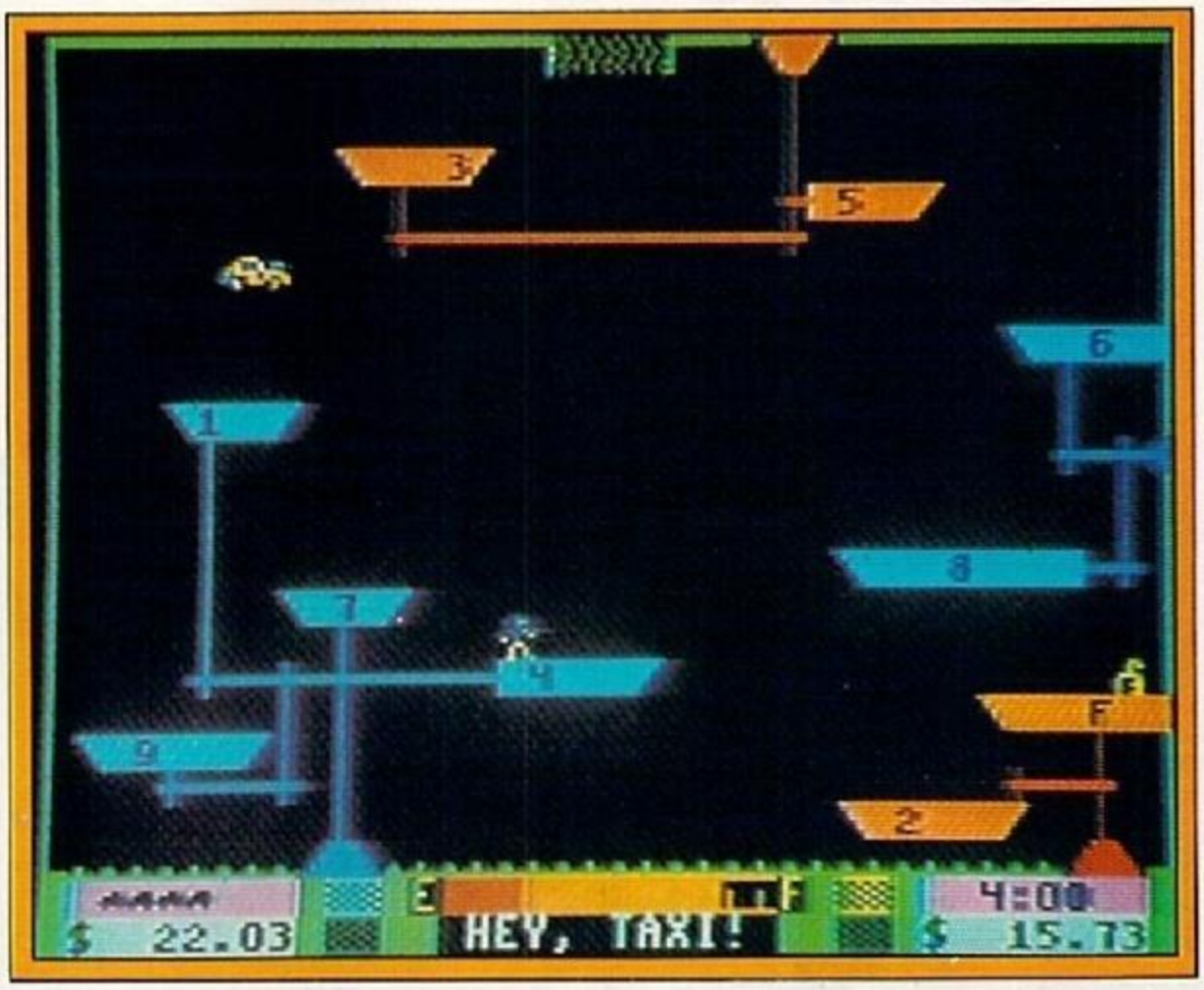

Space Taxi

B

You'll Need Finesse, Agility and Precision To Finish Your Shift

As you navigate your cab through the corridors of a colorful outer space community, a little customer hails you from afar. "Taxi! Hey, Taxi!"

Muse Software's Space Taxi, for the Commodore 64, provides real voice synthesis without additional equipment! Though completely software driven, the voice quality is outstanding.

Not a gimmicky add-on, but an integral part of the play mechanic, the verbalization complements colorful, sometimes cartoony, visuals. Though parts of Space Taxi come off a bit too cute, successfully steering the hack through all 24 screens is a completely serious matter. This setup provides a nice balance of humor, wit and challenge.

Precision is required to angle into tight spots, move to the next screen and gently land on pads and refueling depots. The reckless driver will quickly become a sparkling cinder of space debris. Inertia, gravity and the old adage that two objects can't occupy the same place at the same time are observed in Space Taxi.

Unlike some games, where precision means frustration, the joystick control is perfect. Steering, direction changes and deployment of landing gear with the fire-button are controlled easily.

Up to four cabbies can compete in a game. Each player must complete a shift with a fleet of six high-flying cabs. Each of the five shifts represents a difficulty level. The initial three are composed of eight screens, while the last two (standard and random 24-hour shifts) cycle through every screen, provided you're good enough to make it all the way through!

Greed is the primary motivator. Besides the fare ($5 for a safe transit within a screen and $10 for interscreen trips), a bonus tip meter counts down, starting anywhere from $11 to $19. Any remaining cash is received as a tip, if (and it's a big if) the customer thinks the ride was satisfactory. There's no obligatory tipping here.

Amassing $300 worth of fares (no mean feat) entitles you to a free cab. You'll also have to keep an eye on your fuel consumption. Though your cab isn't a gas guzzler, using a light touch on the joystick will help stretch your gas mileage until you reach a refueling station.

Fuel purchases and delays in picking up customers will deplete the amount earned. For these reasons, finesse and agility are important in navigating your cab through the surrounding scenery, which ranges from sprouting beanstalks and oversized beach furniture to tricky cityscapes and a delightful winter scene, complete with snow and conifers.

A small area at the bottom of the screen is devoted to instrumentation and game status information. A blue landing light indicates that it's safe to land, a yellow one warns you to be cautious, and a red one signifies a one-way trip to the galactic cemetery for reckless drivers. By the way, landing on customers will provoke a verbal complaint from your computer!

Little cab icons portray the number of fleet reserve vehicles, while the screen indicator tells you how far into the shift you are. There is also a takeoff indicator and a fuel gauge.

The bonus tip meter and the earnings meter are on opposite sides of the screen. A message center prints words as they are spoken by your customers.

At the game's end, the crown of immortal cabbie is bestowed upon you if your earnings exceed $50 and fall into the all-time high-score range. It's an honor you'll want to keep pursuing—Space Taxi is a feature-packed game with lots of amusing twists. *(Muse Software, 347 N. Charles St., Baltimore, MD 21201. $29.95.)*

Ted Salamone
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Word Processor–Professional

An Enhanced, Professional Version of Mirage Concepts' Word Processor

Thorough documentation, ease of use and complete menus are the most striking elements of this outstanding word processor, which is from Mirage Concepts.

The first thing you notice about the program is its sturdy, three-ring vinyl binder, which is common among software products for expensive micros, but rare for C-64 programs.

The binder includes a plastic quick-reference card, containing the program's most commonly used commands. The card is handy when you're reading the tutorial, as well as when you're using the program.

The documentation contains 12 chapters, a reference section briefly describing each command, a glossary for first-time word processor users, a section of hints on using the program and a listing of printer commands for the most popular printers.

The 12 chapters are broken into two segments: a beginning tutorial (five chapters) and an advanced tutorial (seven chapters). The manual itself was prepared by professional writers. The contents are lucid, easy to read and logically organized, requiring no previous experience with computers or word processors.

The program begins by letting you select screen colors from a wide palette. Certain color combinations are recommended, depending upon whether you are using a TV or a monitor. After selecting colors, you simply press return, and the program loads in about 30 seconds. You are then instructed to remove the program disk and insert a data disk, which will contain your written material.

A main menu then appears, giving you a choice of submenus. The menus are quite complete, even allowing easy formatting of a blank disk.

The submenus tell you exactly what steps to take. For example, to load a file from your data disk, you are instructed to enter a filename (with a maximum of ten letters) and to press return when you are finished.

Most of your actual writing takes place in the Edit mode. As you enter that mode, a display area at the top of the screen gives you the default values for the printed page. The program sets up a standard 8½" × 11" page. You can change these values, if you wish.

In the Edit mode, there is a counter at the top of the screen to help you keep track of page, line and character number. Below the counter, 17 rows of text are displayed. You do your editing in the twelfth row, which is highlighted in a special color.

The program has 16K of storage space, which is equal to 4½ pages. Although you can chain 4½-page files together to create long documents, the small storage space is the program's main drawback. The program's designers traded file length for the ability to let you see 80 columns of text without additional hardware. Although the normal length of lines in this word processor is 40 columns, pressing f8 will give you an 80-column display. Although the individual characters are virtually illegible in the 80-column display, you can at least get a sense of what your document will actually look like when it is printed. The program also features word wrap, global search and replace, centering and indenting.

This program is an upgraded version of Mirage Concepts' Word Processor, released last year. The enhancements include a 30,000-word spelling checker, an advanced print section (rewritten in assembly language to increase speed) and greater printer compatibility. These enhancements, together with the standard features, make this a powerful and versatile package.

The Word Processor–Professional is an excellent buy for both the experienced user and the novice. Mirage Concepts' emphasis on user friendliness is evident throughout the program. A toll-free customer support telephone line is available to answer questions and provide assistance. *(Mirage Concepts, 4055 W. Shaw # 108, Fresno, CA 93711. $89.95.)*

Jerome Beck
Glendora, CA

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Don't Get TRAPPED IN THE MAZE

By JAMES MILLER

When I first tried simple game programming on the VIC, I was stumped! Poring over scores of game programs and tutorials didn't help much, either. I thought that it was just too tough!

I believed there was some secret (and very complex) formula that controlled everything, a formula that the great gamers knew by intuition and were not about to share with slow-witted folks like me!

But that was my problem. . .I was looking for a solution far more difficult than it really turned out to be! The simplicity of Basic game design is so apparent that I missed it completely!

Maybe that's been your problem, too? If this is the case, let's run through some simple ideas and concepts that really control game action and see how it's done.

This tutorial is for those of you who are too often mystified by computing and want some elementary, step-by-step help!

Screen and Color + Get

After many attempts at Poking and printing graphics and trying, unsuccessfully, to get them to move up and down and right and left on the screen, I finally hit upon a solution.

Poking movement in one direction is easy, but adding the Get command finally gave me four-way keyboard control. The core routine I devised for character movement was so direct and simple that I almost doubted its ability.

If you've dabbled with Pokes at all, you've learned that the computer screen is divided into locations for character and color. On the VIC, the screen begins at location 7680 (upper-left corner) for character placement. For color values, the screen begins at 38400.

From the top left, there are 506 possible Poke locations within a 23-row by 22-column screen.

You can use any part of this total working area. Here's some simple math to keep in mind. If x = your starting point, then:

x + 1 = one space right
x – 1 = one space left
x + 22 = one row down
x – 22 = one row up

Using a GET A$ command combined with a blind Goto loop is just about all you need to create and control a graphics character's movement on the screen.

I'll look at the core routine first. Next, I'll develop and expand it, adding sound and color, then custom characters and a maze. Finally, I'll turn it into a strategy game you play against the clock.

The Core Routine

The core program in Listing 1 is only 12 lines long and could be shortened if you used a lot of multiple statements. The routine takes care of four basic action elements: choosing a starting location for the character, setting a color-value constant, Poking the character and its color to the screen and moving it around.

Line 10 clears the screen.

Line 15 initializes two variables. X is the first screen character location, and CL is the color constant used to color the character.

Line 22 Pokes a ball character (81) in

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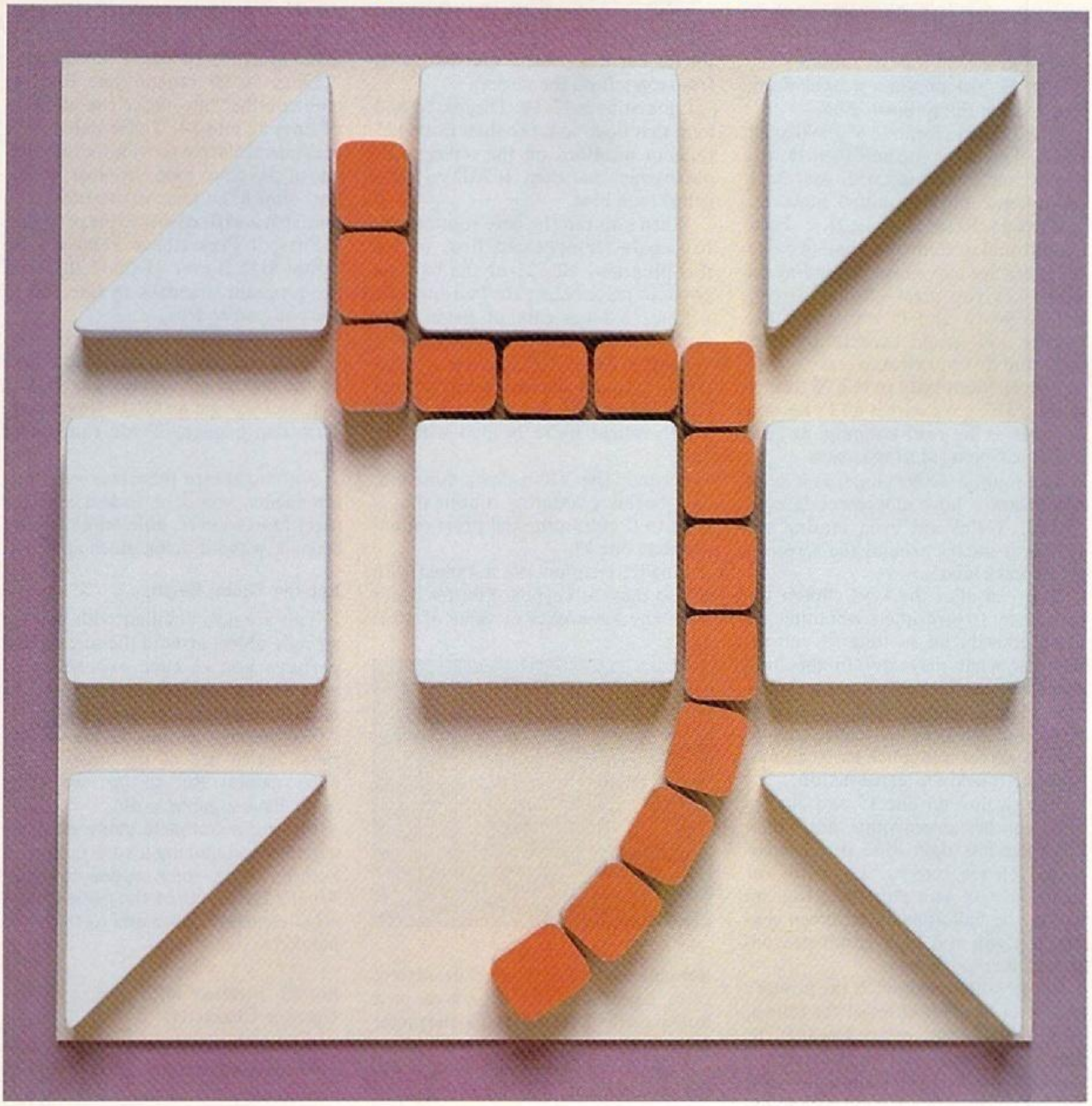

Illustration PHIL GERACI, Photograph ED JUDICE

This article takes you from keyboard character movement through random maze construction, to a complete program, using color, sound and custom characters.

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the first screen position and colors it black.

Line 30 sets up the Get routine.

Line 32 just provides a brief delay loop to slow things down a bit.

Line 33 Pokes location 650 so that all keys will repeat as you hold them down. We're only concerned with four keys for movement in this routine, however.

Lines 35–50 set up four If. . .Then conditional statements that provide for character movement depending on which key you press—the up arrow, left arrow, R and D keys move the ball as you would expect: up, left, right and down, respectively.

Line 60 loops back to line 20 continuously. This ensures that all Pokes and key presses are read instantly, to keep movement going at a brisk pace.

The routine works alone, as it is, to demonstrate how movement is controlled. We're not even erasing the ball as it moves around the screen—that comes later!

You can alter the keys chosen for movement to any others you think are more convenient, as long as you remember what they are! In the final game program, we'll use the cursor control keys plus f5 and f7 for left, right, up and down, because they're close together and much easier to manipulate quickly in game action.

Return now to line 15 and change X to another screen value larger than 7680 but less than 8185 (the last location on the screen). Try 7910, for example. As you run the program again, the ball appears at screen center, but you still have complete control of its movements.

Some games begin with the primary character at the bottom of the screen, and the basic moves are towards the top of the screen. In that case, there's no need for a Down command—like line 50. In fact, it's a good idea to exclude it in some cases, or you'll find your character dropping off the bottom of the screen, into never-never land!

Building a Game

From the core program, you can expand the simple Get movement technique to include routines that begin to create a game atmosphere. The program in Listing 2 is just twice as long as the core routine, and if you study the listing, you'll see it's all there, with only slight changes.

Lines 16–20 are new and initialize new parts of the game structure we're planning. BR in line 16 sets up 125 barrier elements (something to avoid or run into as you move the ball about the screen!). Y is the starting location for the barriers (7702 is one line down from top left on the screen).

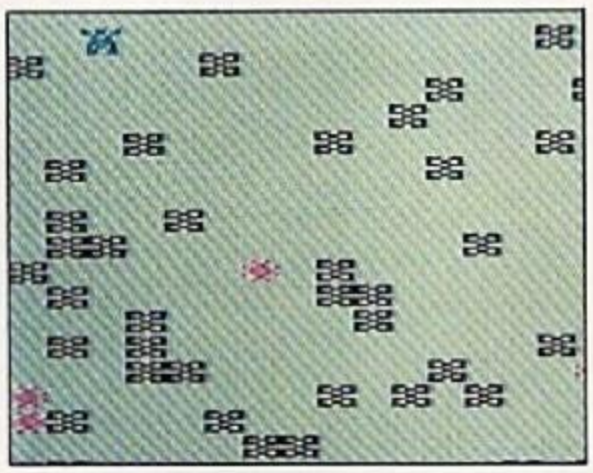
Look at lines 17–18. They serve as a loop that does no more than Poke 125 random locations on the screen with our barrier character, {CMD +}, and colors each blue.

When you ran the core routine, the ball character appeared first, but in this program, all 125 of the barriers pop into place before the ball appears.

Line 19 takes care of three functions necessary in the development of the game. First, it Pokes a goal location (8185) and places a purple symbol that looks somewhat like a # there. That's where we're headed with the ball!

Second, the VIC's clock function, TI$, begins a counting routine that is reset to 0 every time the program encounters line 19.

Finally, location 198 is Poked with a 0 so that the keyboard buffer won't store any keystrokes (a value of 10 is



normal). As you race across the screen, extra keystrokes can be stored in a buffer, thus causing extra character movement when you don't want it.

Line 20 represents a change from the core routine. The REM has been deleted and replaced by a random variable that changes the color of the ball. You remember that line 60 was a Goto statement that sent the program back to line 20.

This adds a nice touch to the program and also helps you know exactly where you are. The ball changes color several times a second and you can turn back on yourself without worry because the color change tells you your position! That would not be the case if we used a single, unchanging color Poke.

Line 22 Pokes the ball character *after* the new color variable; also, the color Poke has been changed to include variable CX, the random color value. Line 29 also is new and prints the clock at the top right of the screen. If more than 29 seconds tick off, the game branches to a new subroutine.

Lines 30–60 remain just like the core routine, but notice the addition of lines 52 and 54. Those pair of IFs are statements that provide the only way out of the Goto loop. In other words, they branch the game to two other routines that add flexibility to the program.

First, if Peek (the # value of) location 8185 is ever 81 (the ball), then the program branches to line 100 to tell you you're free!

If, however, you run into a barrier, the program jumps to line 65 and then to line 200 as a * replaces the {CMD +}, and you get an OUCH! message. That also happens if you run out of time.

Without at least these two branching statements, you'd be locked into the main loop forever, able only to move around, without doing much at all.

Let the Game Begin

You are now familiar with moving a single object around the screen, and perhaps you've even experimented with another character in place of the ball (there are lots of choices).

You've also learned to create barriers, which are at the heart of all maze games. But so far, we really don't have a game at all.

Putting a complete game program together and making it entertaining or exciting takes some added thought. What's the object of the game? What other elements do we add to fill in the blanks?

Sound, Strategy and Custom Characters

By its very nature, a maze game involves escape and, usually, a race against the clock. In addition, most of us like to see some progress or reward, and that's where scores come in.

Beyond that, you may want to explore more of your computer's capabilities, especially its talent for special characters you create in place of common keyboard graphics.

The main Frenzy program (see Listing 3) takes care of all of that and a little more in just 58 lines. Even with the addition of custom characters, there's plenty of memory left for you to experiment, modify and change the program until you have just what you want in a maze game!

The core remains the same, and the branches used in Listing 2 are still there—they're just changed to include scoring, sound and color.

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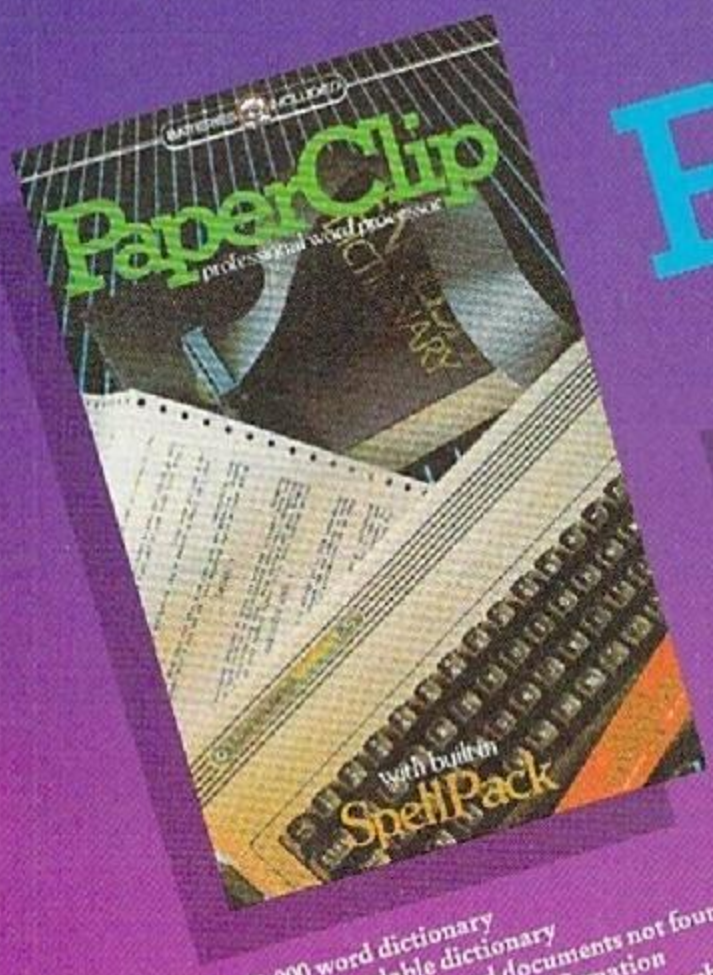

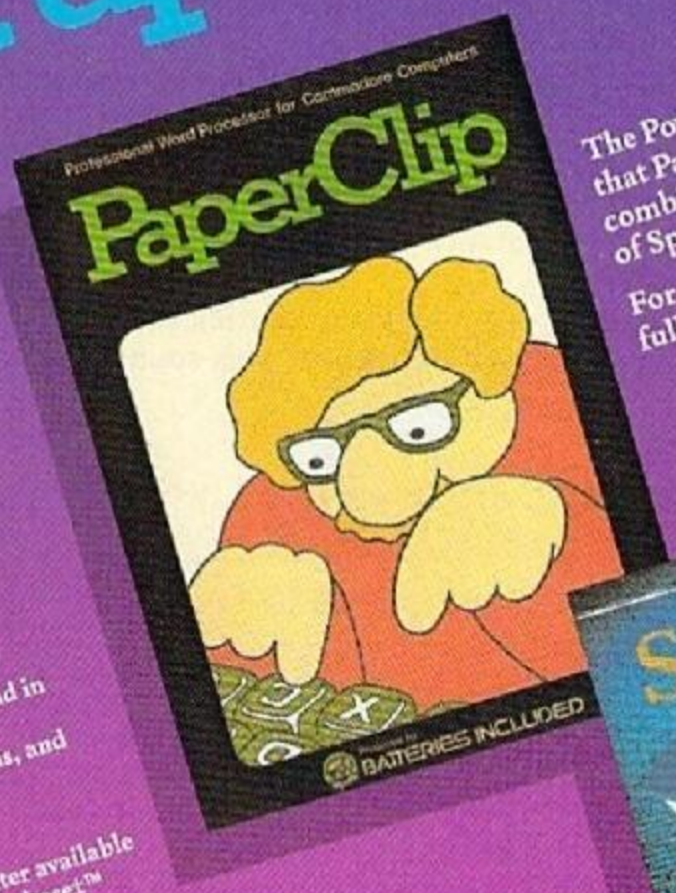

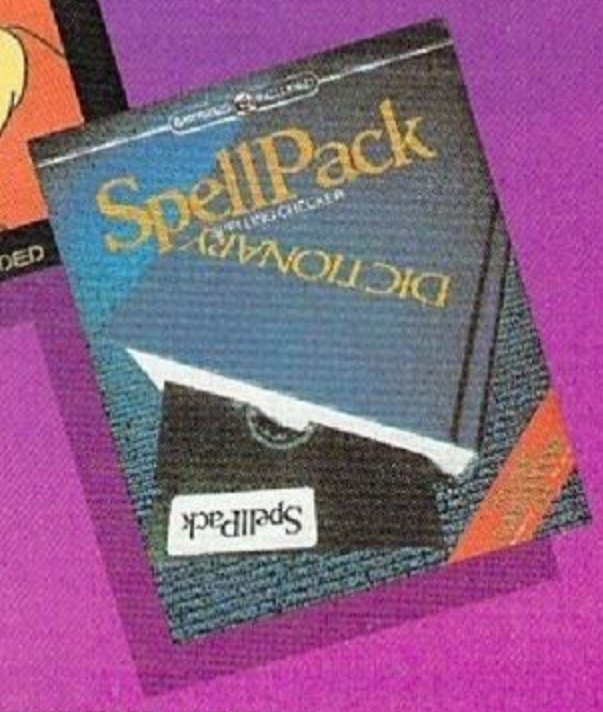

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In addition, several new elements have been added: custom characters, several sound routines, screen color changes, a way to animate the moving character and a way to end the game.

Look over the final program carefully before you type it in. Compare the similarities and differences with the program in Listing 2.

Lines 2–7 take care of special character development by changing three standard keyboard characters (@, [,]) to three created characters that add interest to the game.

In place of a ball is a creature that you can move around the screen. The barriers, too, are customized. Also, a new character is used as an added element in the game. . .a bomb to defuse for points.

Look at lines 35–50. You will see one new command in each line. As the creature moves about the screen, these commands act as an eraser; spaces behind it are Poked with a blank so that the creature doesn't leave a trail as he moves.

Lines 35–50 also change the movement keys, to make things easier on our fingers.

Pressing the cursor-down key moves the creature left only, the cursor-right key moves him right, f5 moves him up and f7 moves him down.

Escapes to the goal (#) earn points, and defusing the bombs earns a bonus. The bombs are randomly Poked on the screen, and there's plenty of time to get most of them.

As an additional element, the maze grows more complex as you advance from round to round, but it's worse on you if you slam into a barrier—points are lost and the maze really grows!

Below, you'll find an explanation of this program's important routines, plus a brief description of the variables and suggestions about changes you may make.

Lines 1–7: Title, lower memory, the creation of custom characters in Data statements.

Lines 8–9: Initialize score and rounds plus barriers.

Lines 10–16: Clear screen, set volume and sound variables plus screen and color locations for each custom character.

Lines 17–22: Poke and randomize character placement, set time TI$ to 0.

Lines 30–60: Get/Goto character movement loop plus conditional branch statements.

Lines 100–110: Routine for incrementing and reporting the score if the goal is reached, plus sound and color changes.

Lines 200–210: Routine for score decrement if barrier hit, plus sound and color changes.

Lines 300–360: Game end routine.

Lines 600–610: Title screen character Poke routine.

Remember that the key to this program remains as simple as the core routine: a short Get/Goto loop takes care of all movement, and the addition of a few If. . .Then branching statements takes care of all the rest—scoring, sound and color. R

Address all author correspondence to James Miller, 2142 Odema Drive, Lima, OH 45806.

SK	= score, RO = round
BR	= barriers
V	= volume
S1, S2	= sound 1&2
X	= beginning character location
CL	= color constant
Y	= beginning location for barriers
Z	= beginning location for bombs
B	= random # of bombs
CY	= random location of bombs
CX	= random color for moving creature

Table 1. *Frenzy program variables.*

Listing 1. *The core program.*

```
10 PRINT"{SHFT CLR}"
15 X=7680:CL=30720
20 REM BALL CHARACTER
22 POKEX,81:POKEX+CL,0
30 GET A$
32 FORD=1TO30:NEXT
33 POKE650,255
35 IFA$="{UP ARROW}"THENX=X-22
40 IFA$="{LEFT ARROW}"THENX=X-1
45 IFA$="R"THENX=X+1
50 IFA$="D"THENX=X+22
60 GOTO 20
```

Listing 2. *Basic game shell to the Frenzy program.*

```
10 PRINT"{SHFT CLR}"
15 X=7680:CL=30720
16 BR=125:Y=7702
17 FORJ=1TOBR:A=INT(RND(1)*475)+1
18 POKEY+A,102:POKEY+A+CL,6:NEXTJ
19 POKE8185,88:POKE8185+CL,4:TI$="000000":P
   OKE198,0
20 CX=INT(RND(1)*5)+2
22 POKEX,81:POKEX+CL,CX
29 PRINT"{HOME}{CTRL 1}";TAB(20);RIGHT$(TI$
   ,2):IFTI$>"000029"THEN65
30 GETA$
32 FORD=1TO30:NEXT
33 POKE650,255
35 IFA$="{UP ARROW}"THENX=X-22
40 IFA$="{LEFT ARROW}"THENX=X-1
45 IFA$="R"THENX=X+1
50 IFA$="D"THENX=X+22
52 IFPEEK(8185)=81THEN100
54 IFPEEK(X)=102THEN65
60 GOTO20
65 POKEX,42:GOTO200
100 PRINT"{HOME}"TAB(17)" {CTRL 9}{CTRL 5}F
    REE{CTRL 0}"
110 FORDE=1TO2500:NEXT:GOTO10
200 PRINT"{HOME}"TAB(17)" {CTRL 9}{CTRL 3}O
    UCH{CTRL 0}"
210 FORDE=1TO2500:NEXT:GOTO10
```

Listing 3. *The main Frenzy program.*

```
1 PRINT"{SHFT CLR}{10 CRSR DNs}"TAB(7)"{CTR
  L 9}FRENZY!{CTRL 0}(@)"
2 POKE52,28:POKE56,28:FORI=7168TO7664:POKEI
  ,PEEK(I+25600):NEXT
3 FORX=7168TO7175:READA:POKEX,A:NEXTX:DATA1
  53,219,36,60,126,90,102,102
4 FORX=7384TO7391:READA:POKEX,A:NEXTX:DATA3
  6,24,189,126,189,24,36,0
5 FORX=7399TO7406:READA:POKEX,A:NEXTX:DATA2
  55,231,153,231,24,231,153,231
7 POKE36869,255:FORDE=1TO2500:NEXT:GOSUB600
8 SK=0:RO=0
9 BR=75
```


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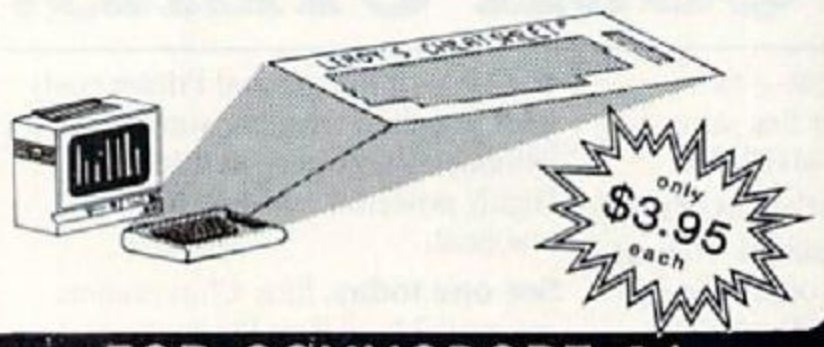

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Listing 3 continued.

```
10 PRINT"{SHFT CLR}":POKE36879,28
12 V=36878:S1=36875
14 S2=36877
15 X=7702:CL=3072Ø
16 Y=7710:Z=79ØØ
17 FORJ=1TOBR:A=INT(RND(1)*465)+1
18 POKEY+A,29:POKEY+A+CL,Ø:NEXTJ
19 POKE8185,35:POKE8185+CL,Ø:TI$="ØØØØØØ":P
   OKE198,Ø
2Ø B=INT(RND(1)*9)+7:FORNX=1TOB:CY=INT(RND(
   1)*175)+1:POKEZ+CY,27
21 POKEZ+CY+CL,2:NEXTNX
22 CX=INT(RND(1)*5)+2:POKEX,Ø:POKEX+CL,CX
24 POKEV,15:POKES1,235
26 FORDE=1TO1Ø:NEXT
28 POKEV,Ø:POKES1,Ø
29 PRINT"{HOME}{CTRL 1}";TAB(2Ø);RIGHT$(TI$
   ,2):IFTI$>"ØØØØ45"THEN65
3Ø GETA$
32 FORD=1TO1Ø:NEXT
33 POKE65Ø,255
35 IFA$=CHR$(136)THENX=X+22:POKEX-22,32
4Ø IFA$=CHR$(135)THENX=X-22:POKEX+22,32
45 IFA$=CHR$(17)THENX=X-1:POKEX+1,32
5Ø IFA$=CHR$(29)THENX=X+1:POKEX-1,32
51 IFPEEK(X)=27THENSK=SK+25:POKEV,15:POKES1
   ,245:FORDE=1TO3Ø:NEXT:POKEV,Ø:POKES1,Ø
52 IFPEEK(8185)=ØTHEN1ØØ
53 IFX>8185THENPOKEX-1,Ø
54 IFPEEK(X)=29THEN65
6Ø GOTO22
65 POKEX,42:POKEX+CL,7:GOTO2ØØ
1ØØ SK=SK+1ØØ+(RO*2):RO=RO+1:POKE36879,121
1Ø1 PRINT"{HOME}"TAB(2)"{CTRL 9}{CTRL 1}SK=
    {CTRL Ø}";SK;" RO=";RO
1Ø2 POKEV,15:FORM=187TO245STEP1Ø
1Ø4 POKES1,M
1Ø6 FORDE=1TO5Ø:NEXT:NEXTM:FORDE=1TO5Ø:NEXT
    :POKES1,147
1Ø7 POKEV,Ø:POKES1,Ø
1Ø8 IFRO=15THEN3ØØ
1Ø9 BR=BR+5
11Ø FORDE=1TO25ØØ:NEXT:GOTO1Ø
2ØØ SK=SK-5Ø:RO=RO+1:POKE36879,47
2Ø1 PRINT"{HOME}"TAB(2)"{CTRL 9}{CTRL 8}SK=
    {CTRL Ø}";SK;" RO=";RO
2Ø2 POKEV,15:FORM=245TO147STEP-.2
2Ø4 POKES2,M:NEXTM
2Ø6 POKEV,Ø:POKES2,Ø
2Ø7 IFRO=15THEN3ØØ
2Ø9 BR=BR+1Ø
21Ø FORDE=1TO25ØØ:NEXT:GOTO1Ø
3ØØ POKE36869,24Ø
3Ø5 PRINT"{SHFT CLR}{2 CRSR DNs}{CTRL 1}GAM
    E OVER!"
31Ø PRINT"{CRSR DN}{CTRL 1}SCORE=";SK
32Ø PRINT"{CRSR DN}{CTRL 1}IN ";RO;" ROUNDS
    "
33Ø PRINT"{2 CRSR DNs}{CTRL 1}PLAY AGAIN(Y/
    N)?"
34Ø GETK$:IFK$=""THEN34Ø
35Ø IFK$="Y"THENRUN7
36Ø IFK$="N"THENEND
6ØØ FORJ=7702TO8185STEP23:POKEJ,Ø:POKEJ+3Ø7
    2Ø,Ø:FORDE=1TO5Ø:NEXT
6Ø7 NEXTJ
61Ø RETURN
```


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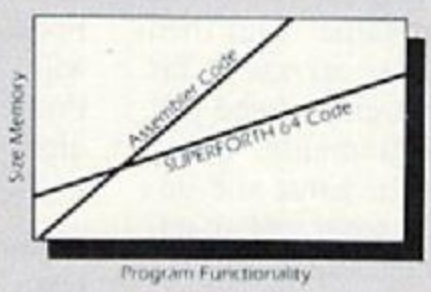

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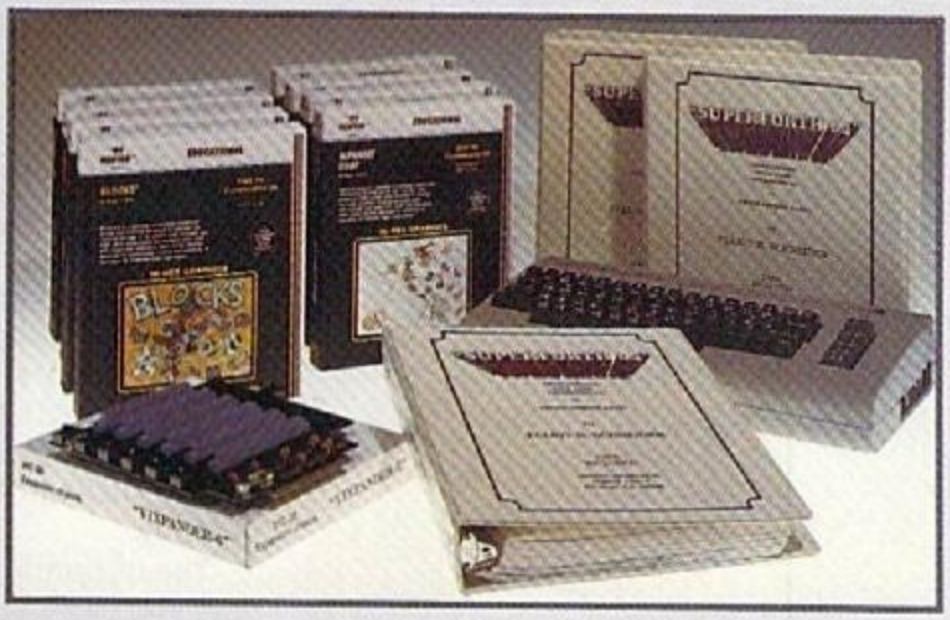

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WRITING WORD GAMES

By M.J. WINTER

If you say, "I'm going to write a Hangman game" and then do it, you have advanced far beyond the beginner who just knows the Basic statements. Being able to both outline the game and implement the outline is what sets an advanced programmer apart from a novice.

In this article, we'll first look at some properties common to word games, and I'll show you how to program these into outline form. I'll construct outlines for three word games: Scramble, Hangman and Word Mastermind. The outlines will provide you with enough detail to make a bare-bones, working game. Once the game is working, you can improve upon it.

Most word games have two requirements: A word must be randomly selected from a list of words in Data statements, and the letters of the selected word are dealt with individually. These properties suggest the programmer should first use a function that will make the computer select a number, FNR(N), which produces integers from 1 to N, and, secondly, make a list of the letters of the word. Elements of a list are easy to change; it is very difficult to alter the middle of a string.

The beginning steps of a game outline are:

1. Select a word W$
2. Make a list of the letters of W$

In the next two sections, we'll generate the code to perform these steps.

Think of a Number

```
10 DEF FNR(X) = INT(RND(1)*X + 1)
```

If the function FNR(X) is defined as in the above line, then each time FNR(6), say, is called, the computer will "think" of a number from 1 to 6. For example, to roll two six-sided dice, you would use:

```
X = FNR(6): Y = FNR(6): PRINT X,Y
```

Suppose you have 20 words listed in Data statements. To pick one at random, let N = FNR(20). Read W$ N times; each time, W$ will be replaced by a new word. The last read value of W$ will be the Nth word in the Data statements.

```
100 N = FNR(20)
110 FOR I = 1 TO N
120 READ W$
130 NEXT I
140 RESTORE
```

(It's always a good idea to use the Restore command after reading data. That way, if you think of another word, the program will start reading from the top of the list.)

List the Letters

The secret word is W$. Since it is very awkward to work with individual letters of a string variable, let's define a list of the letters of W$. L$(1) will be the first letter of W$; L$(2) will be the second letter of W$; L$(3) will be the third letter of W$. And so on. To construct the list (array) L$, use:

```
200 FOR I = 1 TO LEN(W$)
210 L$(I) = MID$(W$,I,1)
220 NEXT I
```

And, since a Basic program must be told the limits of a list's length, enter:

```
5 DIM L$(25)
```

(No word in the Data statements has more than 25 letters.)

Lines 5–220 will be used in all the

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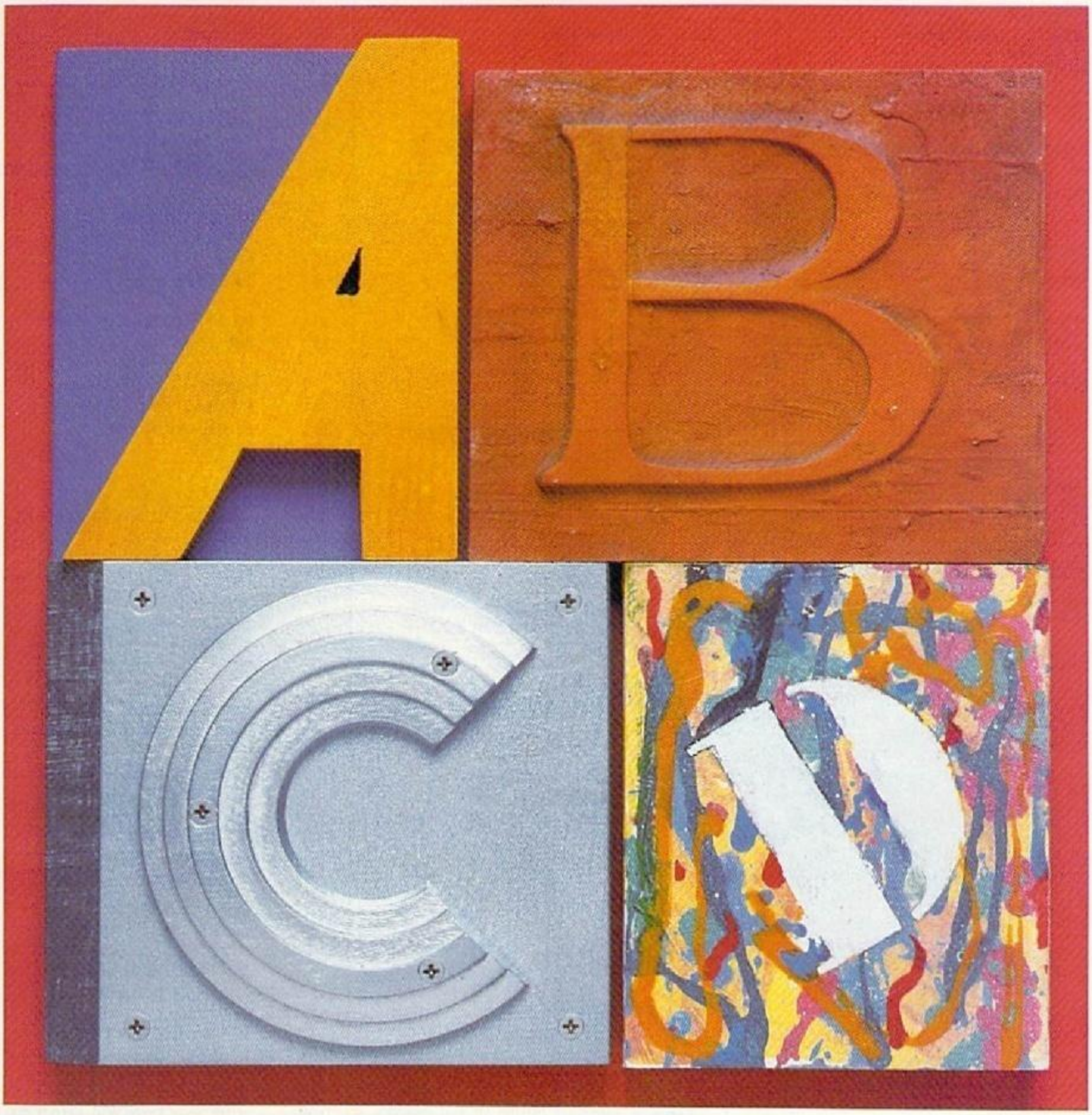

Illustration PHIL GERACI, Photograph ED JUDICE

How would you like to write your own word games, like Scramble, Hangman and Word Mastermind? This article provides you with outlines for these games, to get you started.

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Line	Description
5–140	choose word W$
200–220	make list of letters of W$
300	FOR I = 1 TO LEN(W$)
400	let L = FNR(LEN(W$))
	has letter L been used?
	if yes, gets another L
500	IF L$(L) = "." THEN 400
510	PRINT L$(L);
520	L$(L) = "."
530	NEXT I
600	PRINT
	Asks user to guess word
700	PRINT "GUESS THE WORD"
710	INPUT GW$
	tests:
800	IF GW$ = W$ THEN PRINT "RIGHT": END
820	IF GW$ < > W$ THEN PRINT "WRONG"

Table 1. *Word Scramble outline.*

Line	Description
5–140	choose word W$
20	DIM GL$(25)
200–220	make list of letters of W$
250	FOR I = 1 TO LEN(W$)
260	GL$(I) = "–"
270	NEXT I
300	clear the screen
400	FOR G = 1 TO 10
	prints current version
410	FOR I = 1 TO LEN(W$)
420	PRINT GL$(I);
430	NEXT I
440	PRINT
500	PRINT "GUESS A LETTER"
510	INPUT A$
	checks whether A$ is in word
600	FOR I = 1 TO LEN(W$)
610	IF A$ = L$(I) THEN 1000
620	NEXT I
	if here, then A$ not in word
	later print body part #G here
750	NEXT G
800	if here, then game is lost
810	PRINT "WORD WAS " W$
820	END
	makes all replacements
1000	FOR I = 1 TO LEN(W$)
1010	IF A$ = L$(I) THEN GL$(I) = A$
1020	NEXT I
	now checks if done
	gets another letter if not done
1100	FOR I = 1 TO LEN(W$)
1110	IF GL$(I) = "–" THEN 410
1120	NEXT I
1200	PRINT "RIGHT"
1210	PRINT "WORD WAS "W$
1220	END

Table 2. *Hangman outline, without graphics.*

Line	Description
5–140	choose word W$
20	DIM C$(25), GL$(25)
200–220	make list of the letters of W$
300	tells player how many letters in W$
	makes copy of list
400	FOR I = 1 TO LEN(W$)
410	C$(I) = L$(I)
420	NEXT I
500	PRINT "GUESS A WORD"
510	INPUT A$
	makes list of letters of A$
600	FOR I = 1 TO LEN(W$)
610	GL$(I) = MID$(A$,I,1)
620	NEXT I
	counts black pegs
	crosses out letters getting black pegs
700	BP = 0
710	FOR I = 1 TO LEN(W$)
720	IF GL$(I) = C$(I) THEN BP = BP + 1:C$(I) = ".":GL$(I) = "."
730	NEXT I
	counts white pegs
	doesn't look at any periods
800	WP = 0
810	FOR I = 1 TO LEN(W$)
820	IF GL$(I) = "." THEN 860
830	FOR J = 1 TO LEN(W$)
840	IF GL$(I) = C$(J) THEN WP = WP + 1:C$(J) = ".":GOTO860
850	NEXT J
860	NEXT I
	IF BP = 0 THEN 1000
900–950	print black pegs here
	IF WP = 0 THEN 1100
1000–1050	print white pegs here
	tests if done
1100	if BP < > LEN(W$) THEN 400

Table 3. *Word Mastermind outline.*

following examples. All the games must have Data statements containing 20 words.

Scramble

The outline for Scramble is simple. After the word, W$, is selected and a list of the letters made, the letters must be printed in random order. In terms of "steps," the program first chooses a number, L. If letter number L, L$(L), has already been used, the program chooses another L. When an unused L is selected, the letter L$(L) is printed; L$(L) is then scratched off—set equal to a period. When all the letters have been printed, the player is asked to guess the word.

Table 1 shows an outline for the Word Scramble game; the line numbers for each step are indicated.

If the guess is incorrect, you might want to show another scrambling of the same word. Since the list L$(I) is now all periods, it must be reconstructed. After line 820, you would go to line 200.

To score this game, you might add:

```
20 SC = 110
230 SC = SC – 10
```

A player who gets the word on the first guess will get 100 points; every rescrambling will cost the player ten points.

Hangman

In Hangman, not only do you need a list of the letters of W$, but you

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need a list of the "letters" of the guessed word. Call this list GL$(I). GL$(I) will begin as a set of dashes. As letters are guessed, the GL$ will be updated.

The body in Hangman usually has ten parts: head, torso, arms, legs, hands and feet. Let's allow the user ten guesses.

Checking whether the guessed letter is in the word and making the replacements are separate parts of the program. The checking is done to decide whether to replace letters in GL$ or to add a body part.

Table 2 is an outline of Hangman, without graphics.

To add graphics, you'll need a list of body parts, BP$(I). BP$(1) will draw the head, BP$(2) will draw the torso, and so on. These should be added before line 100. A simple body might start:

```
60 BP$(1) = "{2 CRSR RTs}O"
62 BP$(2) = "{2 CRSR RTs}{CRSR DN}
   {CMD +}{CRSR DN}{CRSR LF}
   {CMD +}"
```

Before drawing each body part, move the cursor to row 11 by printing P$: which consists of a {CRSR HOME} followed by ten {CRSR DNs}. Make these changes:

```
20 DIM GL$(25),BP$(10)
30 P$ = "{CRSR HOME followed by 10
   CRSR DNs}"
410 PRINT "{CRSR HOME}";: FOR I = 1
   TO LEN(W$)
740 PRINT P$;BP$(G)
```

Word Mastermind

This game begins in the same way as the others: a word is selected, and a list of the letters of the word is made. Calculating the score, however, involves scratching out letters that have been matched. A copy of the list C$(I) is used for this. Each time the player guesses a word A$, a list of the letters of A$ must be made. This list will be GL$(I).

Table 3 is an outline of the game. Try to write the program.

Deciding how to print the pegs is left as an exercise. Use the cursor color controls and the ball on the Q key.

All the games have been presented in skeleton form. Get them running, then make them fancier. Add scoring, color, graphics, instructions and so on. They're your games. R

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SMOKING JOE

A Spritely Program

By MARK JORDAN

Sprites are the greatest things since plastic straws, but their potential is largely untapped. Documentation for them is not hard to come by, but most of it is too technical, depressingly uncreative and fails to demonstrate their unique capabilities. I've discovered six programming tricks that have added many dimensions to my sprite programming. Smoking Joe, the program included with this article, demonstrates all these techniques. If my explanations of any of the tricks confuse you, just run the program, and Joe will clear the smoke.

One last note: Three of the sprites in this program are interrupt-driven by a machine language routine. If you don't know machine language, don't worry about it. You'll still be able to glean plenty from the Basic portion of the program.

Alpha Sprites

Sprites are excellent places to put words because you can push them around very handily and can needlepoint them into any design you want. For example, if you wanted to show a plane in the sky, pulling a message behind it, you could jerk letters eight pixels at a time, using a complicated printing routine, or you could do it professionally with a sprite.

But wait, you say. A sprite is only 24 pixels across. At eight pixels per letter, that's only enough space for three letters. True, but who said you have to use eight pixels per letter? You can halve that amount and still get crisp letters. . .with this trick.

Use the Horizontal Expansion mode. If you've never done it, it's easy. Just turn on the proper bit (bit 0 for sprite 0, etc.) on register 53277 (D01D in hex, V + 29 with V at 53248), and your sprite will double its width. The Horizontal mode will double the thickness of all your vertical lines. That way, to form the letter H, you only need one pixel for each vertical side, another for the crossbar and a fourth as a separating space from the next occurring letter. An L could be made with only three pixels (including separating space). "HELLO" in this mode only requires 16 dots in the X direction—a mere two-thirds of your total 24. You could create words up to eight letters long.

As you know, sprites are 21 pixels deep. Capital-letter alpha sprites need five pixels for most letters and another for a separating space, so you'll probably only get words that are three letters long.

Need some ideas where to use word sprites? How about a cartoon-type balloon above another sprite's head, expressing a monosyllabic emotion such as "Ouch!" Or try one as a warning message scrolling across the screen, like "Duck!" or "Run!" Smoking Joe uses two alpha sprites—"Puff" and "X-Ray." Check them out—you'll be amazed at how charming and useful alpha sprites can be.

Window Sprites

This trick utilizes the background priority register, 53275 ($D01B). The Default mode sets all bits to 0, which causes the sprites to always have priority over background data. Admittedly, this is often what you want,

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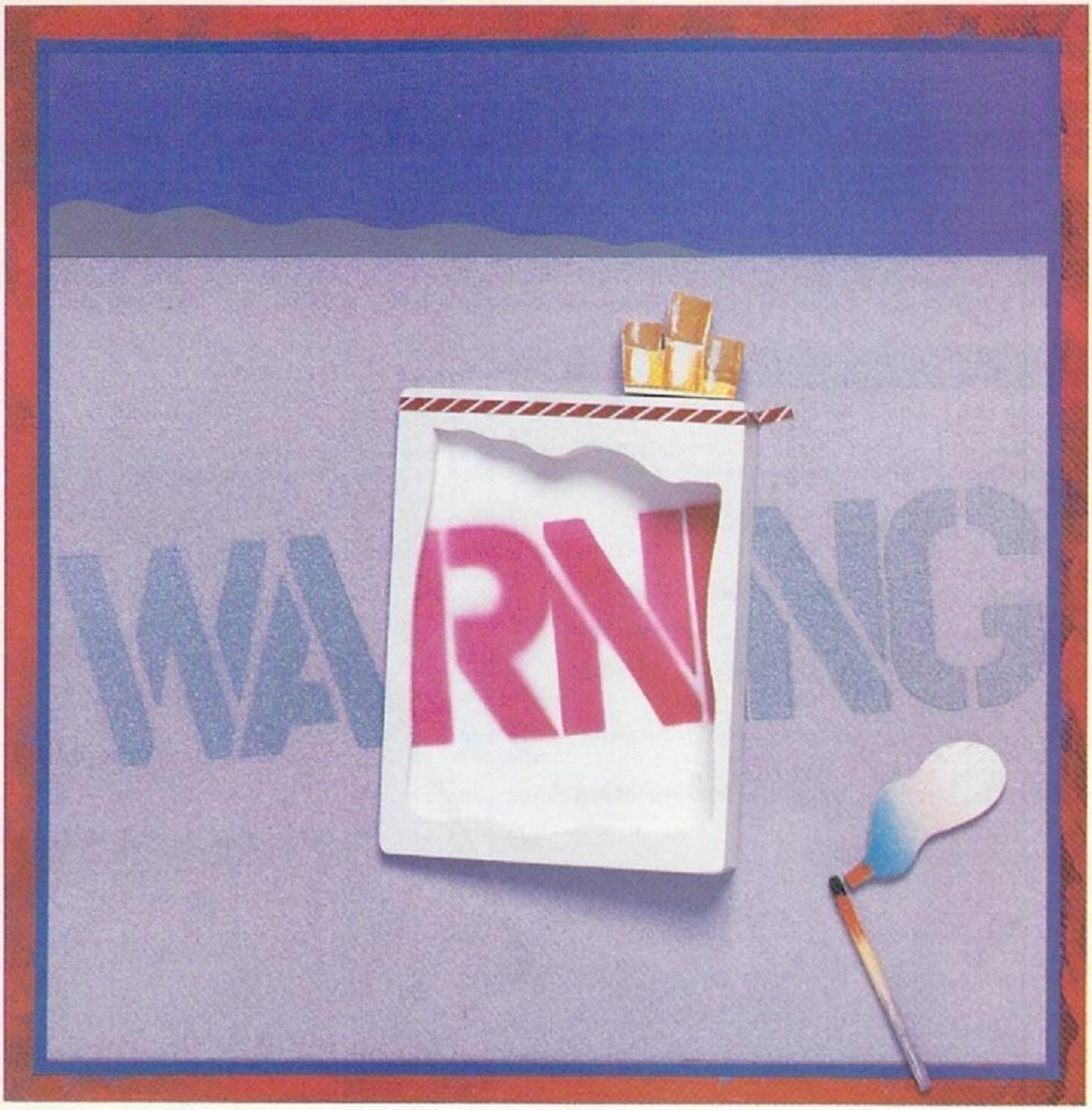

Illustration PHIL GERACI, Photograph ED JUDICE

Warning: The Surgeon General has determined that the following six tricks and accompanying program will make it impossible for you not to be more creative in your sprite programming.

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but reversing the situation will give you some clever effects.

Print a message on the screen in the same color as the background, so the message can't be seen. What good is this invisible message? A lot, if you use a sprite to uncover it.

Now make a simple solid box sprite like this:

```
FOR T = 12288 TO 12350: POKE T,255: NEXT
```

Place it under your invisible message. The sprite can be made to move, via joystick, keyboard, loop or whatever, across the hidden letters, and, if bit number 0 on 53275 is set to 1, the letters will show up on top of the sprite. The effect is one of a roving window or periscope.

You can use this technique to hide secret information on the screen; only a sprite can uncover it. You may also use this technique to keep a sprite in safe territory. Individual letters, functioning as clues, can be dispersed across the screen. Again, you are limited only by your imagination. Observe the use of the window sprite in Smoking Joe—a cigarette package. Ah, but what wisdom it unearths.

Layered Sprites

Sprites that are stacked one on top of another are layered. They're easy to keep together as long as you always move them in harmony. The uses of layered sprites are many and varied.

You could design one sprite as a body minus some parts, then use another to supply the missing elements.

Listing 1. *Smoking Joe program for the C-64.*

```
1Ø POKE53281,1:POKE5328Ø,1: N=1:SC=167Ø:CC=
   55942:POKE252,25:POKE254,5
2Ø PRINT"{SHFT CLR}{4 CRSR DNs}{CTRL 2}CAUT
   ION:{2 SPACEs}SMOKING IS HAZARDOUS{COMD
   7}
3Ø FORT=12288TO1267Ø:READA:POKET,A:NEXT
4Ø FORT=49152TO49215:READA:POKET,A:NEXT
5Ø V=53248:POKEV+27,255:POKEV+29,25:POKEV+2
   3,24:O=V+21
6Ø FORT=ØTO7:POKEV+T+39,14:POKET+2Ø4Ø,T+192
   :NEXT
7Ø POKEV,7Ø:POKEV+2,52:POKEV+4,52:POKEV+6,1
   Ø:POKEV+8,42:POKEV+1Ø,62
8Ø POKEV+1,13Ø:POKEV+3,162:POKEV+5,183:POKE
   V+7,64:POKEV+9,183:POKEV+11,166
9Ø POKESC,16Ø:POKECC,1
1ØØ PRINT"{15 CRSR DNs}MEET JOE.";:POKEO,6:
    FORT=1TO25ØØ:NEXT
1Ø5 PRINT"{3 SPACEs}HE SMOKES."
11Ø POKESC,32:SP=39:SYS49152:FORT=1TO25ØØ:N
   EXT
12Ø GOSUB67Ø
13Ø Z=Z+1:IFZ=3THENSP=47
14Ø IFZ=11THEN16Ø
15Ø GOTO12Ø
16Ø PRINT"{CRSR UP}JOE'S BREATH GETS SHORTE
   R":GOSUB67Ø:POKE252,8:POKE254,2
17Ø FORI=ØTO6:GOSUB67Ø:NEXT
18Ø PRINT"{CRSR UP}{1Ø SPACEs}JOE'S LUNGS G
   ROW BLACKER . . .":POKE252,5:POKE254,1
19Ø POKEO,51:POKEV+1,145:FORT=29TOØSTEP-1:P
   OKET+12547,255
2ØØ FORI=1TOT*25:NEXT:POKEV+1,145:NEXT
21Ø PRINT"{SHFT CLR}{6 CRSR DNs}{CRSR UP}FI
   NALLY, JOE TAKES HIS LAST . . .":SP=18:
   GOSUB68Ø:POKE254,2
22Ø FORT=ØTO22:POKEV+3,162+T
23Ø FORI=1TO1ØØ:NEXT:NEXT
24Ø POKEV+1,12Ø:PRINT"{SHFT CLR}
25Ø POKEV+23,17:POKEO,1:POKE254,255:GOSUB68
   Ø
26Ø FORT=12288TO1235Ø:RN=INT(RND(Ø)*256):PO
   KET,PEEK(T)ANDRN
27Ø NEXT:C=C+1
28Ø IFC<6THEN26Ø
29Ø PRINT,"{8 CRSR DNs}{4 SPACEs}DON'T SMOK
   E !"
3ØØ POKEV+2,1ØØ:POKEV+3,115:POKEO,2
31Ø GOTO31Ø
32Ø REM "PUFF"
33Ø DATA 3, 57, 224, 28, 198, 24, 32, Ø, 6,
    78, 7, 1, 73, 2Ø, 245, 73, 84, 133
34Ø DATA 142, 86, 2Ø1, 136, 84, 137, 136, 8
   4, 129, 72, 96, 145, 64, Ø, 6, 6Ø
35Ø DATA 24, 56, 2, 39, 192, 3, 192, Ø, Ø,
   6, Ø, Ø, 9, Ø, Ø, 6, Ø, Ø, Ø, Ø, Ø
36Ø DATA 48, Ø, Ø, 72, Ø, Ø, 48, Ø
37Ø REM{2 SPACEs}JOE'S HEAD
38Ø DATA 1Ø3, 15, 224, Ø, 6Ø, 248, Ø, 113,
   255, 56, 255, 255, 252, 234, 255
39Ø DATA 252, 191, 16Ø, 32, 255, 134, 112,
   255, 2ØØ, 16, 243, 195, 56, 225, 192
4ØØ DATA 16, 225, 128, 8, 225, 128, 132, 97
   , 128, 66, 124, Ø, 62, 112, Ø, 8
41Ø DATA 232, Ø, 248, 8, 128, 24, 4, 96, 44
   , 2, 24, 198, 1, 7, 3, Ø, 129, Ø
42Ø REM{2 SPACEs}JOE'S BODY
43Ø DATA 1Ø3, 3, 255, 128, 4, Ø, 32, 8, 32,
    16, 16, 32, 16, 31, 192, 16, 16
44Ø DATA 64, 112, 16, 64, 144, 16, 128, 144
   , 21, Ø, 144, 17, Ø, 8Ø, 17, Ø, 8Ø
45Ø DATA 17, 255, 16Ø, 8, 247, 16Ø, 7, 247,
    192, 3, 239, Ø, 3, 2Ø7, Ø, 3
46Ø DATA 2Ø7, Ø, 3, 2Ø7, Ø, 3, 199, Ø, 3, 2
   52, 248, 3, 254, 252
47Ø REM{2 SPACEs}CIGARETTES
48Ø DATA 1Ø3, Ø, 1, 224, Ø, 7, 32, Ø, 29, 3
   2, Ø, 21, 32, 15, 245, 32, 15, 255
49Ø DATA 224, 15, 255, 224, 15, 255, 224, 1
   5, 255, 224, 15, 255, 224, 15, 255
5ØØ DATA 224, 15, 255, 224, 15, 255, 224, 1
   5, 255, 224, 15, 255, 224, 15, 255
51Ø DATA 224, 15, 255, 224, 15, 255, 224, 1
   5, 255, 224, 15, 255, 224, Ø, Ø, Ø
52Ø REM{2 SPACEs}X-RAY
53Ø DATA255, 127, 255, 254, 252, 56, 127, 2
   4Ø, 16, 31, 224, 16, 15, 224, 16, 15
54Ø DATA 224, 56, 15, 224, 56, 15, 224, 56,
    15, 24Ø, 124, 31, 248, 124, 63, 252
55Ø DATA 254, 127, 255, 255, 255, 192, Ø, 3
   , 192, Ø, 3, 2Ø2, Ø, 3, 2Ø2, 114, 83
56Ø DATA 2Ø2, 87, 83, 196, 1Ø1, 35, 2Ø2, 87
   , 35, 2Ø2, 85, 35, 2Ø2, Ø, 3, 16Ø
57Ø REM{2 SPACEs}JOE A-PUFFING
58Ø DATA Ø, Ø, Ø, Ø, Ø, 6, Ø, Ø, 25, Ø, Ø,
   18, Ø, Ø, 12, Ø, Ø, Ø, Ø, Ø, Ø, Ø
59Ø DATA Ø, Ø, Ø, Ø, Ø, Ø, Ø, 1Ø, Ø, Ø, 18,
    Ø, Ø, 12, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø
6ØØ DATA 96, Ø, Ø, 64, Ø, Ø, Ø, Ø, Ø, Ø, 28
   , Ø, Ø, 12, Ø, Ø, 4, Ø, Ø
61Ø REM INTERRUPT DATA
62Ø DATA 12Ø, 169, 13, 141, 2Ø, 3, 169, 192
   , 141, 21, 3, 88, 96, 238
63Ø DATA 6, 2Ø8, 198, 253, 165, 253, 2Ø8, 7
   , 2Ø6, 1, 2Ø8, 165, 254, 133
64Ø DATA 253, 198, 251, 165, 251, 2Ø8, 26,
   24, 173, 1Ø, 2Ø8, 74, 176, 9
65Ø DATA 238, 1Ø, 2Ø8, 2Ø6, 11, 2Ø8, 76, 57
   , 192, 2Ø6, 1Ø, 2Ø8, 238, 11
66Ø DATA 2Ø8, 165, 252, 133, 251, 76, 49, 2
   34
67Ø POKEV+1,145:POKEO,SP:GOSUB68Ø:POKEO,SP-
   1:GOSUB68Ø:RETURN
68Ø FORK=1TO5ØØ:NEXT:RETURN
```


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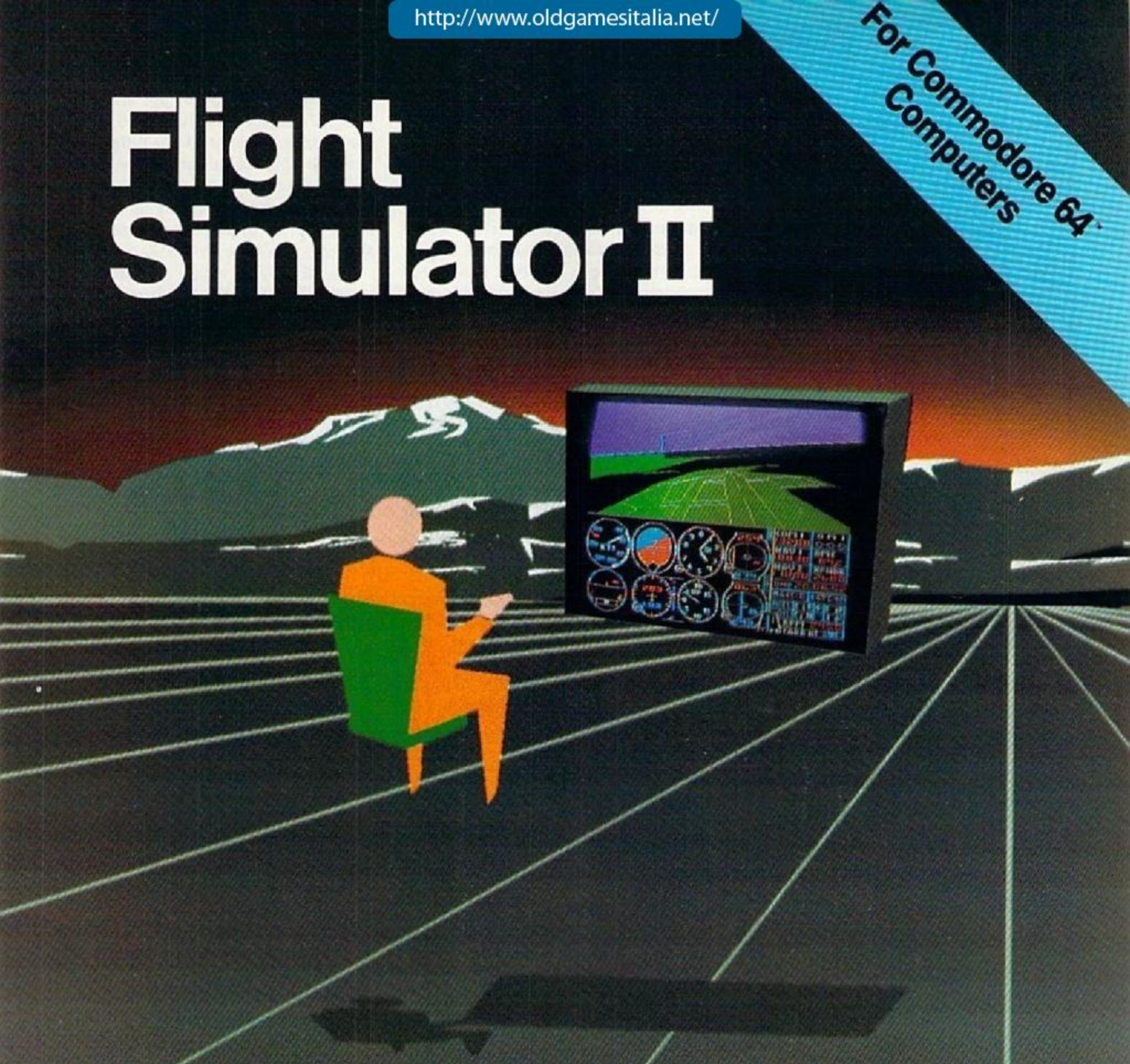

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You could then animate the layered parts independent of the foundation sprite.

For example, you could use a heart-shaped sprite centered on a sprite boy's chest. Then, when sprite boy meets sprite girl, you might start sprite boy's heart pulsating by jumping it in and out of Expanded mode (love at first sprite?). Is such an effect worth an extra 63 bytes of data and five or so program lines? You bet. Just watch Smoking Joe's chest (and cigarette smoke) rise and fall, and you'll see the value of this ploy.

Another use of layered sprites utilizes the collision-detection register. You program one of the layered sprites (but not the other) to detect collisions. Imagine having a sprite creature whose innards are actually a different sprite. Since only the innards detect collisions, a bullet you shoot must hit a vital organ, or no luck.

You might decide to let one of the stacked MOBs (moveable object blocks—the technical term for sprites) function as a window sprite. You could create an eyeless Martian, who must "see" through his hands. Only his hands, which would be a different sprite entirely, would have background priority. He could then "feel" his way across the screen to find invisible information.

Multiple Sprites

It's tough to make a complete body in a 24×21 grid of dots. A superficial solution to this problem is to expand the sprites, which sometimes helps, but you lose resolution and still don't have any more realistic figure than you did before—just bigger.

Why not use two sprites to accomplish the same thing? This trick is so obvious you've probably thought of it, but have you actually done it? It really works.

Combined with animation, you can get your sprites to get down and get with it. Make a person in two halves and let the legs walk. Smoking Joe is a prime example of this technique. If you incorporate the reverse sprite feature, you can achieve a comical effect by having Joe's head turning from side to side while his body remains stationary.

Evolving Sprites

By altering the data that comprises a sprite, you can make it do interesting things. For instance, you can watch it dissolve or fill up. For what? Well, how about this.

You design a milk bottle and then use a data-altering routine to slowly fill in the bottle from the bottom up. If the bottle sits beneath a multiple sprite cow, then you've got some fun going. A thirsty sprite cat could reverse the process. Smoking Joe's lungs aptly describe this technique as the blackness of his disease spreads. Lines 190–200 perform this by changing the data in the sprite block, in reverse order and one at a time, to 255s.

The dissolving idea is a little harder to describe. Smoking Joe shows off this technique as his final puff of smoke dissolves. Lines 260–270 should be studied to see how random numbers (between 0 and 255), used with AND along with the existing data, cause the sprite to slowly wisp away.

You can do a sprite kaleidoscope by Poking in all the necessary numbers to get a sprite going, then filling the data block like this:

```
100 FOR T = 12288 TO 12350 : R = INT (RND
(0) * 256) : POKET,R : NEXT : GOTO 100
```

Cover Sprites

This technique is based on the ability of sprites to move one pixel at a time. By creating a solid block sprite and giving it the same color as your screen's background, you can effectively, dot by dot, either hide or reveal something.

You might have a stick of dynamite with a long fuse. Your cover sprite could slowly but surely make that fuse disappear. Or you could use a timer technique similar to many professional games like Frogger, where a solid bar represents remaining time. The bar could be printed on the screen, and a horizontally expanded solid sprite bar (which would be invisible because it's the same color as the screen background) would be placed next to it and then incremented a pixel at a time until the printed bar was covered.

Smoking Joe utilizes background data as a cover sprite. In Joe's introduction, a reversed space that is the same color as the screen's background was printed over Joe's cigarette. Then, when the program tells you of his bad habit, the space is deleted and there dangles his vice.

Well, there they are—six nifty ways to put new life into your 64's moveable object blocks. Now it's your turn. Get busy and put Smoking Joe to shame. R

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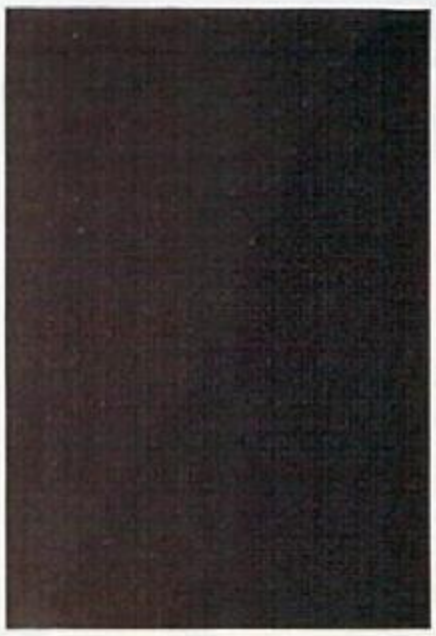

Quatro

By SOL STEINBERG

This game adds a new dimension to tic-tac-toe. You must get four *in a row to defeat your opponent.*

This strategy game is like Tic-Tac-Toe, but more difficult. The playing field is seven columns wide and eight rows high. You play by choosing a column, and the computer then enters your color in the *lowest* unoccupied square in your chosen column. The first player to occupy four squares in a line (horizontally, vertically or diagonally) wins.

The program will ask if you want instructions. Type Y for yes or N for no. Next, you'll be asked if you want to play against the computer or another player. Type C or P.

If you type P, the game will start and one player will be red and the other black. The computer's only functions in this situation will be to act as a recorder and an umpire; it will neither allow illegal moves nor overlook a win.

If you type C, you'll be asked for the play level. Type A for amateur, P for pro or W for world class. At the pro level, the computer looks ahead to see that it doesn't create new opportunities for you to win. At the world class level, the computer sets traps and waits for you to fall into them. If you are playing against the computer, you will always be red.

Each player will be asked "Which Column?" Simply type the column number you want to play, and the computer will fill the next vacant square with your color and will sound a tone. It also will check to see if that move gives you a win and if any squares are left to be played. A winning move receives a fanfare. After each game, the program will ask if you want to play again. Type Y or N. The starting player varies with each new game.

If you play against the computer, the computer's first play is random, to provide variety in the games. Try to control the center of the playing field and avoid creating an opportunity for your opponent to win. You must keep in mind that each time you move to a square, the square above that one becomes available to your opponent.

In designing the program, I placed the most frequently used subroutines near the beginning, to obtain maximum speed. Despite that, the computer takes nearly 15 seconds per move; it must consider every possible combination of four contiguous squares that includes the available square in the chosen column.

Queuing Up

Lines 140–170 calculate the value, V(C), of playing a column after the number of red, black and empty squares in the line of four squares is known. The calculation depends on the offensive and defensive potential of a move. It also determines if a win is possible or a block is necessary (W will be the winning column and B the blocking one).

This routine is entered with Q telling whether offense or defense is being considered and T giving the number of red or black squares in the line of four squares. If $T=-1$, then the line is useless for offense or already blocked for defense.

Lines 180–320 calculate the number of red and black squares in each combination of four squares that the potential move involves. Line 140 is then called to evaluate that combination. Each set evaluates a different direction—180–210 vertical, 220–260 horizontal, 270–320 diagonal.

Lines 350–1160 determine the lines to

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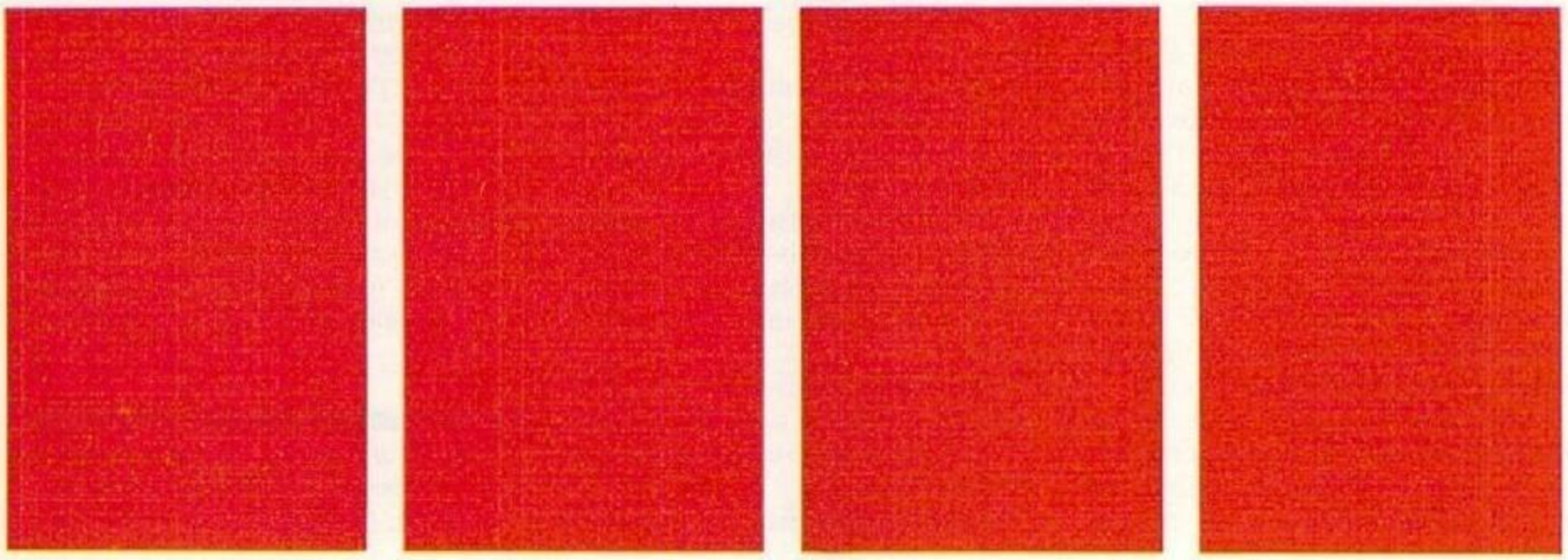

Listing 1. *Four in a Row program.*

```
10Ø REM FOUR-IN-A ROW BY SOL STEINBERG
11Ø DIMV(7),G(7,7),N(7)
12Ø GOSUB193Ø
13Ø PLAYER=1:GOTO14ØØ
14Ø IFT=-1THENRETURN
15Ø IFQ=1THENV(C)=V(C)+1ØØ{UP ARROW}T:IFT=3
    THENW=C
16Ø IFQ=-1THENV(C)=V(C)+1Ø*1ØØ{UP ARROW}(T-
    1):IFT=3THENB=C
17Ø RETURN
18Ø T=Ø:FORI=ØTO3:IFG(X+I,Y)=QTHENT=T+1:GOT
    O2ØØ
19Ø IFG(X+I,Y)=-QTHENT=-1:I=3
2ØØ NEXTI
21Ø GOTO14Ø
22Ø FORJ=1TO4:T=Ø:FORI=ØTO3
23Ø IFG(C,J+I)=QTHENT=T+1:GOTO25Ø
24Ø IFG(C,J+I)=-QTHENT=-1:I=3
25Ø NEXTI:GOSUB14Ø:IFT=ØTHENJ=4
26Ø NEXTJ:RETURN
27Ø T=Ø:FORI=ØTO3:IFG(X+I,Y+I)=QTHENT=T+1:G
    OTO29Ø
28Ø IFG(X+I,Y+I)=-QTHENT=-1:I=3
29Ø NEXTI:GOTO14Ø
3ØØ T=Ø:FORI=ØTO3:IFG(X+I,Y-I)=QTHENT=T+1:G
    OTO32Ø
31Ø IFG(X+I,Y-I)=-QTHENT=-1:I=3
32Ø NEXTI:GOTO14Ø
33Ø PRINT"{HOME}{2Ø CRSR DNs}{CTRL 1} HMM,
    LET'S SEE... "
34Ø IFMOVE=1ORMOVE=ØTHENC=INT(7*RND(Ø))+1:W
    =Ø:GOTO132Ø
35Ø FORI=1TO7:V(I)=Ø:NEXTI:W=Ø:B=Ø:IFN(1)=8
    THENV(1)=-1ØØ:GOTO4ØØ
36Ø C=1:X=1:Y=N(1):Q=1:GOSUB18Ø:Q=-1:GOSUB1
    8Ø
37Ø GOSUB22Ø:Q=-Q:GOSUB22Ø
38Ø IFN(1)<5THENGOSUB27Ø:Q=-Q:GOSUB27Ø
39Ø IFN(1)>3THENGOSUB3ØØ:Q=-Q:GOSUB3ØØ
4ØØ IFN(2)=8THENV(2)=-1ØØ:GOTO5ØØ
41Ø C=2:Y=N(2):FORX=1TO2:GOSUB18Ø:NEXTX
42Ø Q=-Q:FORX=1TO2:GOSUB18Ø:NEXTX
43Ø GOSUB22Ø:Q=-Q:GOSUB22Ø
44Ø IFN(2)<2ORN(2)>5THEN46Ø
45Ø X=1:Y=N(2)-1:GOSUB27Ø:Q=-Q:GOSUB27Ø
46Ø IFN(2)<5THENX=2:Y=N(2):GOSUB27Ø:Q=-Q:GO
    SUB27Ø
47Ø IFN(2)>6ORN(2)<3THEN49Ø
48Ø X=1:Y=N(2)+1:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
49Ø IFN(2)>3THENX=2:Y=N(2):GOSUB3ØØ:Q=-Q:GO
    SUB3ØØ
5ØØ IFN(3)=8THENV(3)=-1ØØ:GOTO64Ø
51Ø C=3:Y=N(3):FORX=1TO3:GOSUB18Ø:NEXTX
52Ø Q=-Q:FORX=1TO3:GOSUB18Ø:NEXTX
53Ø GOSUB22Ø:Q=-Q:GOSUB22Ø
54Ø IFN(3)<3ORN(3)>6THEN56Ø
55Ø X=1:Y=N(3)-2:GOSUB27Ø:Q=-Q:GOSUB27Ø
56Ø IFN(3)<2ORN(3)>5THEN58Ø
57Ø X=2:Y=N(3)-1:GOSUB27Ø:Q=-Q:GOSUB27Ø
58Ø IFN(3)<5THENX=3:Y=N(3):GOSUB27Ø:Q=-Q:GO
    SUB27Ø
59Ø IFN(3)<2ORN(3)>5THEN61Ø
6ØØ X=1:Y=N(3)+2:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
61Ø IFN(3)<3ORN(3)>6THEN63Ø
62Ø X=2:Y=N(3)+1:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
63Ø IFN(3)>3THENX=3:Y=N(3):GOSUB3ØØ:Q=-Q:GO
    SUB3ØØ
64Ø IFN(4)=8THENV(4)=-1ØØ:GOTO82Ø
65Ø C=4:Y=N(4):FORX=1TO4:GOSUB18Ø:NEXTX
66Ø Q=-Q:FORX=1TO4:GOSUB18Ø:NEXTX
67Ø GOSUB22Ø:Q=-Q:GOSUB22Ø
68Ø IFN(4)<4THEN7ØØ
69Ø X=1:Y=N(4)-3:GOSUB27Ø:Q=-Q:GOSUB27Ø
7ØØ IFN(4)<3ORN(4)>6THEN72Ø
71Ø X=2:Y=N(4)-2:GOSUB27Ø:Q=-Q:GOSUB27Ø
72Ø IFN(4)<2ORN(4)>5THEN74Ø
73Ø X=3:Y=N(4)-1:GOSUB27Ø:Q=-Q:GOSUB27Ø
74Ø IFN(4)<5THENX=4:Y=N(4):GOSUB27Ø:Q=-Q:GO
    SUB27Ø
75Ø IFN(4)>4THEN77Ø
76Ø X=1:Y=N(4)+3:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
77Ø IFN(4)<2ORN(4)>5THEN79Ø
78Ø X=2:Y=N(4)+2:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
79Ø IFN(4)<3ORN(4)>6THEN81Ø
8ØØ X=3:Y=N(4)+1:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
81Ø IFN(4)>3THENX=4:Y=N(4):GOSUB3ØØ:Q=-Q:GO
    SUB3ØØ
82Ø IFN(5)=8THENV(5)=-1ØØ:GOTO98Ø
83Ø C=5:Y=N(5):FORX=2TO4:GOSUB18Ø:NEXTX
84Ø Q=-Q:FORX=2TO4:GOSUB18Ø:NEXTX
85Ø GOSUB22Ø:Q=-Q:GOSUB22Ø
86Ø IFN(5)<4THEN88Ø
87Ø X=2:Y=N(5)-3:GOSUB27Ø:Q=-Q:GOSUB27Ø
```

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be checked for each column.

Lines 1170–1180 check for a possible win or necessary block.

Lines 1190–1210 determine which column has the greatest value.

Line 1220 checks for the level of play. If the level is amateur or the move cannot be harmful or cannot be avoided, the column with the highest value is played. This is the end of the amateur level.

Lines 1230–1260 check to see if the move will set up a win for the player. This uses the routine at 2110, which checks for a win. This check is the only difference between amateur and pro.

Lines 1270–1310 check to see if the level is world class. If so, the computer checks to see if it should leave that column as a trap for you. If, by playing that column, you would allow the computer to win (by playing that column next), the computer will try to avoid that column.

Lines 1320–1390 display the computer's move.

Lines 1400–1590 initialize the game.

Lines 1600–1690 set red's move, check it for validity, check for a win and adjust all variables.

Lines 1700–1810 determine if you are playing against the computer or another player. If another player, then it does the same for black that was just done for red.

Lines 1820–1860 give the result of the game and ask if you want to play again.

Lines 1870–1900 initialize variables for a new game.

Lines 1910–1920 erase obsolete information from the screen.

Lines 1930–2040 get the initial player input regarding instructions, opponent and level.

Lines 2050–2270 check for a win.

Lines 2280–2310 announce the winner.

Lines 2320–2430 give instructions.

Lines 2440–2570 provide tones after each move and a fanfare for victory.

I hope you will find this game a welcome break from arcade and adventure types. If you don't want to type in this program, send me your name, address and $4, and I'll send you the program on disk. R

Address all author correspondence to Sol Steinberg, Apt. Q9, Hyde Park Apts., Bellmawr, NJ 08031.

Listing continued.

```
88Ø IFN(5)<3ORN(5)>6THEN9ØØ
89Ø X=3:Y=N(5)-2:GOSUB27Ø:Q=-Q:GOSUB27Ø
9ØØ IFN(5)<2ORN(5)>5THEN92Ø
91Ø X=4:Y=N(5)-1:GOSUB27Ø:Q=-Q:GOSUB27Ø
92Ø IFN(5)>4THEN94Ø
93Ø X=2:Y=N(5)+3:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
94Ø IFN(5)<2ORN(5)>5THEN96Ø
95Ø X=3:Y=N(5)+2:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
96Ø IFN(5)<3ORN(5)>6THEN98Ø
97Ø X=4:Y=N(5)+1:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
98Ø IFN(6)=8THENV(6)=-1ØØ:GOTO11ØØ
99Ø C=6:Y=N(6):FORX=3TO4:GOSUB18Ø:NEXTX
1ØØØ Q=-Q:FORX=3TO4:GOSUB18Ø:NEXTX
1Ø1Ø GOSUB22Ø:Q=-Q:GOSUB22Ø
1Ø2Ø IFN(6)<4THEN1Ø4Ø
1Ø3Ø X=3:Y=N(6)-3:GOSUB27Ø:Q=-Q:GOSUB27Ø
1Ø4Ø IFN(6)<3ORN(6)>6THEN1Ø6Ø
1Ø5Ø X=4:Y=N(6)-2:GOSUB27Ø:Q=-Q:GOSUB27Ø
1Ø6Ø IFN(6)>4THEN1Ø8Ø
1Ø7Ø X=3:Y=N(6)+3:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
1Ø8Ø IFN(6)<2ORN(6)>5THEN11ØØ
1Ø9Ø X=4:Y=N(6)+2:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
11ØØ IFN(7)=8THENV(7)=-1ØØ:GOTO117Ø
111Ø C=7:X=4:Y=N(7):GOSUB18Ø:Q=-Q:GOSUB18Ø
112Ø GOSUB22Ø:Q=-Q:GOSUB22Ø
113Ø IFN(7)<4THEN115Ø
114Ø X=4:Y=N(7)-3:GOSUB27Ø:Q=-Q:GOSUB27Ø
115Ø IFN(7)>4THEN117Ø
116Ø X=4:Y=N(7)+3:GOSUB3ØØ:Q=-Q:GOSUB3ØØ
117Ø IFW<>ØTHENC=W:GOTO132Ø
118Ø IFB<>ØTHENC=B:GOTO132Ø
119Ø C=1:FORI=2TO7
12ØØ IFV(I)>V(C)THENC=I
121Ø NEXTI
122Ø IFV(C)<-9ØORLE$="A"ORN(C)=7THEN132Ø
123Ø N(C)=N(C)+1:G(C,N(C))=-1:Q=-1
124Ø GOSUB211Ø:G(C,N(C))=Ø:N(C)=N(C)-1
125Ø IFW=ØTHEN127Ø
126Ø W=Ø:V(C)=-95:GOTO119Ø
127Ø IFLE$="P"THEN132Ø
128Ø N(C)=N(C)+1:G(C,N(C))=1:Q=1
129Ø GOSUB211Ø:G(C,N(C))=Ø:N(C)=N(C)-1
13ØØ IFW=ØTHEN132Ø
131Ø W=Ø:V(C)=-91:GOTO119Ø
132Ø PRINT"{CTRL 1}{HOME}{2Ø CRSR DNs}{2 SP
    ACEs}COMPUTER PLAYS";C
133Ø PRINT"{HOME}":FORI=1TO15-2*N(C):PRINT"
    {CRSR DN}";:NEXTI:PRINTTAB(C+C+1Ø)"{CT
    RL 1}{CTRL 9} "
134Ø HF=5:GOSUB244Ø
135Ø G(C,N(C))=1:N(C)=N(C)+1
136Ø IFW<>ØTHENGOSUB249Ø
137Ø IFW<>ØTHENPRINT"{HOME}{2Ø CRSR DNs}":P
    RINT"{2 SPACEs}COMPUTER WINS!!!":GOTO1
    83Ø
138Ø PRINT"{HOME}{17 CRSR DNs}":MOVE=MOVE+1
    :IFMOVE=49THEN182Ø
139Ø GOTO16ØØ
14ØØ POKE53281,5:PRINT"{SHFT CLR}{CTRL 7}":
    GOSUB187Ø
141Ø PRINT"{SHFT CLR}{CTRL 7}"
142Ø PRINTTAB(11)"{COMD A}{SHFT C}{COMD R}{
    SHFT C}{COMD R}{SHFT C}{COMD R}{SHFT C
    }{COMD R}{SHFT C}{COMD R}{SHFT C}{COMD
     R}{SHFT C}{COMD S}"
143Ø PRINTTAB(11)"{SHFT B}{SHFT W}{SHFT B}{
    SHFT W}{SHFT B}{SHFT W}{SHFT B}{SHFT W
    }{SHFT B}{SHFT W}{SHFT B}{SHFT W}{SHFT
     B}{SHFT W}{SHFT B}"
144Ø PRINTTAB(11)"{COMD Q}{SHFT C}{SHFT +}{
    SHFT C}{SHFT +}{SHFT C}{SHFT +}{SHFT C
    }{SHFT +}{SHFT C}{SHFT +}{SHFT C}{SHFT
     +}{SHFT C}{COMD W}"
145Ø PRINTTAB(11)"{SHFT B}{SHFT W}{SHFT B}{
    SHFT W}{SHFT B}{SHFT W}{SHFT B}{SHFT W
    }{SHFT B}{SHFT W}{SHFT B}{SHFT W}{SHFT
     B}{SHFT W}{SHFT B}"
146Ø PRINTTAB(11)"{COMD Q}{SHFT C}{SHFT +}{
    SHFT C}{SHFT +}{SHFT C}{SHFT +}{SHFT C
    }{SHFT +}{SHFT C}{SHFT +}{SHFT C}{SHFT
     +}{SHFT C}{COMD W}"
147Ø PRINTTAB(11)"{SHFT B}{SHFT W}{SHFT B}{
    SHFT W}{SHFT B}{SHFT W}{SHFT B}{SHFT W
    }{SHFT B}{SHFT W}{SHFT B}{SHFT W}{SHFT
     B}{SHFT W}{SHFT B}"
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Listing continued.

```
148Ø PRINTTAB(11)"{COMD Q}{SHFT C}{SHFT +}{
     SHFT C}{SHFT +}{SHFT C}{SHFT +}{SHFT C
     }{SHFT +}{SHFT C}{SHFT +}{SHFT C}{SHFT
      +}{SHFT C}{COMD W}"
149Ø PRINTTAB(11)"{SHFT B}{SHFT W}{SHFT B}{
     SHFT W}{SHFT B}{SHFT W}{SHFT B}{SHFT W
     }{SHFT B}{SHFT W}{SHFT B}{SHFT W}{SHFT
      B}{SHFT W}{SHFT B}"
15ØØ PRINTTAB(11)"{COMD Q}{SHFT C}{SHFT +}{
     SHFT C}{SHFT +}{SHFT C}{SHFT +}{SHFT C
     }{SHFT +}{SHFT C}{SHFT +}{SHFT C}{SHFT
      +}{SHFT C}{COMD W}"
151Ø PRINTTAB(11)"{SHFT B}{SHFT W}{SHFT B}{
     SHFT W}{SHFT B}{SHFT W}{SHFT B}{SHFT W
     }{SHFT B}{SHFT W}{SHFT B}{SHFT W}{SHFT
      B}{SHFT W}{SHFT B}"
152Ø PRINTTAB(11)"{COMD Q}{SHFT C}{SHFT +}{
     SHFT C}{SHFT +}{SHFT C}{SHFT +}{SHFT C
     }{SHFT +}{SHFT C}{SHFT +}{SHFT C}{SHFT
      +}{SHFT C}{COMD W}"
153Ø PRINTTAB(11)"{SHFT B}{SHFT W}{SHFT B}{
     SHFT W}{SHFT B}{SHFT W}{SHFT B}{SHFT W
     }{SHFT B}{SHFT W}{SHFT B}{SHFT W}{SHFT
      B}{SHFT W}{SHFT B}"
154Ø PRINTTAB(11)"{COMD Q}{SHFT C}{SHFT +}{
     SHFT C}{SHFT +}{SHFT C}{SHFT +}{SHFT C
     }{SHFT +}{SHFT C}{SHFT +}{SHFT C}{SHFT
      +}{SHFT C}{COMD W}"
155Ø PRINTTAB(11)"{SHFT B}{SHFT W}{SHFT B}{
     SHFT W}{SHFT B}{SHFT W}{SHFT B}{SHFT W
     }{SHFT B}{SHFT W}{SHFT B}{SHFT W}{SHFT
      B}{SHFT W}{SHFT B}"
156Ø PRINTTAB(11)"{COMD Z}{SHFT C}{COMD E}{
     SHFT C}{COMD E}{SHFT C}{COMD E}{SHFT C
     }{COMD E}{SHFT C}{COMD E}{SHFT C}{COMD
      E}{SHFT C}{COMD X}"
157Ø PRINTTAB(11)" 1 2 3 4 5 6 7":PRINT
158Ø PLAYER=-PLAYER
159Ø IFPLAYER=1THEN17ØØ
16ØØ PRINT"{CTRL 3}{2 SPACEs}RED, WHICH COL
     UMN?{2 SPACEs}{2 CRSR LFs}";
161Ø GETC$:IFC$<>""THEN161Ø
162Ø GETC$:IFC$<"1"ORC$>"7"THEN162Ø
163Ø C=VAL(C$):PRINTC:IFN(C)=8THENPRINT"THA
     T COLUMN IS FULL!":GOSUB191Ø:GOTO16ØØ
164Ø PRINT"{HOME}":FORI=1TO15-2*N(C):PRINT"
     {CRSR DN}";:NEXTI:PRINTTAB(C+C+1Ø)"{CT
     RL 3}{CTRL 9} "
165Ø HF=25:GOSUB244Ø
166Ø G(C,N(C))=-1
167Ø Q=-1:GOSUB2Ø5Ø:IFW=1THEN228Ø
168Ø N(C)=N(C)+1
169Ø PRINT"{HOME}{17 CRSR DNs}":MOVE=MOVE+1
     :IFMOVE=49THEN182Ø
17ØØ IFOP$="C"THEN33Ø
171Ø PRINT"{CTRL 1}BLACK, WHICH COLUMN?{2 S
     PACEs}{2 CRSR LFs}";
172Ø GETC$:IFC$<>""THEN172Ø
173Ø GETC$:IFC$<"1"ORC$>"7"THEN173Ø
174Ø C=VAL(C$):PRINTC:IFN(C)=8THENPRINT"THA
     T COLUMN IS FULL!":GOSUB191Ø:GOTO171Ø
175Ø PRINT"{HOME}":FORI=1TO15-2*N(C):PRINT"
     {CRSR DN}";:NEXTI:PRINTTAB(C+C+1Ø)"{CT
     RL 1}{CTRL 9} "
176Ø HF=5:GOSUB244Ø
177Ø G(C,N(C))=1
178Ø Q=1:GOSUB2Ø5Ø:IFW=1THEN23ØØ
179Ø N(C)=N(C)+1
18ØØ PRINT"{HOME}{17 CRSR DNs}":MOVE=MOVE+1
     :IFMOVE=49THEN182Ø
181Ø GOTO16ØØ
182Ø PRINT"{CTRL 7}THE GAME IS A DRAW. NOBO
     DY WINS."
```

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A Printer For All Reasons

Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want, but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We wanted to give our customers the best printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the GP-550CD from Seikosha, a division of Seiko (manufacturers of everything from wrist watches to space hardware). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing up to a respectable (and honest) 86 characters per second, and with a very readable 9 (horizontal) by 8 (vertical) character matrix. At this rate, you will get an average 30 line letter printed in only 28 seconds.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The GP-550CD has a print mode termed Near Letter Quality printing (NLQ mode). This is where the GP-550CD outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 9 (horizontal) by 16 (vertical). This equates to 14,400 addressable dots per square inch. Now we're talking ***quality*** printing. You can even do graphics in the high resolution mode. The results are the best we've ever seen. The only other printers currently available having resolution this high go for $500 and more *without* the interface or cable needed to hook up to your Commodore!

Features That Won't Quit

With the GP-550CD your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 18 font styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy software commands right from your keyboard. All fonts have true descenders.

One of the fonts we like best is "Proportional" because it looks most like typesetting. The spacing for thin characters like "i" and "l" are given less space which "tightens" the word making reading easier and faster. This is only one example of the careful planning put into

Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) to make the words stand out. Or, if you wish to be even more emphatic, underline the words. Or do both. You may also wish to "headline" a title. Each basic font has a corresponding elongated (double-wide) version. You can combine any of these modes to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line.

You can now do virtually any line spacing you want. You may select 6, 8, 7½ or 12 lines per inch. PLUS you have variable line spacing of 1.2 lines per inch to infinity (no space at all) and **97** other software selectable settings in between. You control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and... VOILA! The letter now fits on one page.

Forms? Yes! Your Letterhead? Of Course!

Do you print forms? No problem. This unit will do them all. Any form up to 10 inches wide. The tractors are adjustable from 4½ to 10 inches. Yes, you can also use single sheets. Plain typing paper, your letterhead, short memo forms, anything you choose. Any size under 10" in width. Multiple copies? **Absolutely!** Put forms or individual sheets with carbons (up to 3 deep), and the last copy will be as readable as the first. Spread sheets with many columns? **Of course!** Just go to condensed mode printing and print a full 136 columns wide. Forget expensive wide-carriage printers and changing to wide carriage paper. You can now do it all on a standard 8½" page.

Consistent Print Quality

Most printers have a continuous loop ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade after a while. To keep the printers' output looking consistently dark, the ribbons must be changed more often than is healthy for the pocketbook. The GP-550CD solves this problem completely by using a replaceable, inexpensive ink cassette which is separately replaceable from the actual ribbon. It keeps the ribbon loaded with ink at all times. You only replace the ribbon when it truly wears out, not when it starts to run low on ink. Just another example of the superb engineering applied to the GP-550CD. (When you finally do wear out your ribbon, replacement cost is only $10.95. Ink cassette replacement cost is only $5.95, both postpaid.)

The Best Part

When shopping for a quality printer with all these features, you could expect to pay around $500 or more. *Not any more!* We have done our homework. You don't have to worry about interfaces or cables. Everything is included. We are now able to sell this fantastic printer for **only $259.95!** The GP-550CD is built especially for the Commodore 64, VIC-20, Plus 4 and C-16. All Commodore graphics are included. This printer does everything the Commodore printers do but has more features. **You need absolutely nothing else to start printing –just add paper.** We also have specific models for other computers. Call for details.

No Risk Offer

We give you a 15-day satisfaction guarantee. If you are not completely satisfied for any reason we will refund the full purchase price. A 1-year warranty is included with your printer. The warranty repair policy is to repair or replace and reship to the buyer within 72 hours.

The Bottom Dollar

The GP-550CD is only $259.95. Shipping and insurance is $8.00 — UPS within the continental USA. If you are in a hurry, UPS Blue (second day air) is $18.00. Canada, Alaska, Mexico are $25.00 (air). Other foreign is $60.00 (air). California residents add 6% tax. These are cash prices — VISA and MC add 3% to total. We ship the next business day on money orders, cashiers' checks, and charge cards. A 14-day clearing period is required for checks.

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Listing continued.

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183Ø PRINT"{CTRL 7}{3 SPACEs}DO YOU WANT TO
      PLAY AGAIN?"
184Ø GETA$:IFA$="Y"THEN14ØØ
185Ø IFA$="N"THENPRINT"{3 SPACEs}LET'S PLAY
      AGAIN REAL SOON!":END
186Ø GOTO184Ø
187Ø FORI=1TO7:N(I)=1
188Ø FORJ=1TO7:G(I,J)=Ø
189Ø NEXTJ,I:MOVE=Ø:W=Ø
19ØØ RETURN
191Ø FORI=1TO15ØØ:NEXTI:PRINT"{2 CRSR UPs}{
     36 SPACEs}"
192Ø PRINT"{34 SPACEs}":PRINT"{2 CRSR UPs}"
     ;:RETURN
193Ø PRINT"{SHFT CLR}{3 CRSR DNs}"
194Ø PRINTTAB(13)"FOUR-IN-A-ROW{CRSR DN}"
195Ø PRINT"DO YOU WANT INSTRUCTIONS?{CRSR U
     P}"
196Ø GETOP$:IFOP$="Y"THEN232Ø
197Ø IFOP$<>"N"THEN196Ø
198Ø PRINT"DO YOU WANT TO PLAY AGAINST THE
     COMPUTEROR ANOTHER PLAYER (C OR P)?";
199Ø GETOP$:IFOP$="P"THENRETURN
2ØØØ IFOP$<>"C"THEN199Ø
2Ø1Ø PRINT"{2 SPACEs}COMPUTER"
2Ø2Ø PRINT"{CRSR DN}LEVEL OF PLAY - AMATEUR
     , PRO OR WORLD{3 SPACEs}CLASS (A,P OR
     W)?"
2Ø3Ø GETLE$:IFLE$="A"ORLE$="P"ORLE$="W"THEN
     RETURN
2Ø4Ø GOTO2Ø3Ø
2Ø5Ø REM TEST FOR WIN BEFORE N(C) CHANGES
2Ø6Ø W=Ø
2Ø7Ø IFN(C)<4THEN211Ø
2Ø8Ø J=Ø:FORI=ØTO3
2Ø9Ø J=J+G(C,N(C)-I)
21ØØ NEXTI:IFJ=4*QTHENW=1:RETURN
211Ø J=Ø:FORI=1TO7
212Ø IFG(I,N(C))=QTHENJ=J+1
213Ø IFG(I,N(C))<>QTHENJ=Ø
214Ø IFJ=4THENW=1
215Ø NEXTI:IFW=1THENRETURN
216Ø J=Ø:X=N(C)-C:FORI=1TO7
217Ø IF(X+I)<1OR(X+I)>7THEN221Ø
218Ø IFG(I,X+I)=QTHENJ=J+1
219Ø IFG(I,X+I)<>QTHENJ=Ø
22ØØ IFJ=4THENW=1
221Ø NEXTI:IFW=1THENRETURN
222Ø J=Ø:X=N(C)+C:FORI=1TO7
223Ø IF(X-I)<1OR(X-I)>7THEN227Ø
224Ø IFG(I,X-I)=QTHENJ=J+1
225Ø IFG(I,X-I)<>QTHENJ=Ø
226Ø IFJ=4THENW=1
227Ø NEXTI:RETURN
228Ø PRINT"{HOME}{2Ø CRSR DNs}":PRINT"{7 SP
     ACEs}RED WINS!!!"
229Ø GOSUB249Ø:GOTO183Ø
23ØØ PRINT"{HOME}{2Ø CRSR DNs}":PRINT"{5 SP
     ACEs}BLACK WINS!!!"
231Ø GOSUB249Ø:GOTO183Ø
232Ø PRINT"{3 CRSR DNs}THIS IS THE SAME AS
     THE GAME CALLED"
233Ø PRINT"CONNECT-FOUR. IT IS LIKE TIC-TAC
     -TOE,"
234Ø PRINT"BUT YOU MUST GET 4 IN A ROW. EAC
     H PLAY"
235Ø PRINT"MUST BE THE LOWEST AVAILABLE ROW
      IN A"
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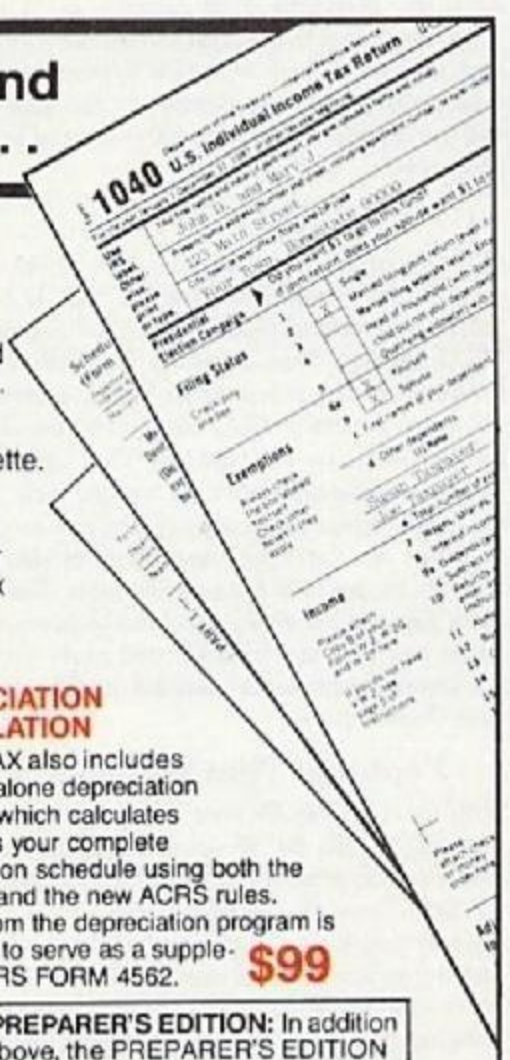

FOR TAX PLANNING

Using either screen or printer output, SUPERTAX generates clear and concise summaries of Page 1 and 2 and Schedule A of FORM 1040 allowing you to see at a glance and to quickly comprehend your tax situation. This program also prints an OVERALL SUMMARY of the return showing Adjusted Gross Income, Itemized Deductions, Taxable Income, Regular Tax and Payment Due or Refund—all of which are calculated by the program. SUPERTAX also calculates the moving expense deduction, investment credit, taxable capital gains, political and child care credits, medical limitations, and much more. Input is fast and easy and changes can be made in seconds. This program actually makes tax planning a breeze.

FOR RETURN PREPARATION

SUPERTAX PRINTS THE INCOME TAX RETURN: This program prints page 1, page 2 of the FORM 1040, Schedules A, B, C, W and G (income averaging) of the FORM 1040 as well as FORM 3468 (investment tax credit) on standard IRS government forms or on blank computer paper for use with transparencies. Any item of input can be changed in seconds and the entire return is automatically recalculated to instantly reflect the change.

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SUPERTAX also includes a stand alone depreciation program which calculates and prints your complete depreciation schedule using both the old rules and the new ACRS rules. Output from the depreciation program is designed to serve as a supplement to IRS FORM 4562. $99

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Listing continued.

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236Ø PRINT"COLUMN. IN THE PARKER BROS. VERS
     ION,"
237Ø PRINT"THE GAME IS PLAYED WITH CHECKERS
      THAT"
238Ø PRINT"SLIDE DOWN A SEVEN COLUMN DEVICE
      AND"
239Ø PRINT"THE COLOR OF THE CHECKERS SHOWS
     THROUGH"
24ØØ PRINT"HOLES IN THE DEVICE."
241Ø PRINT:PRINT"{11 SPACEs}PRESS ANY KEY"
242Ø GETOP$:IFOP$=""THEN242Ø
243Ø PRINT"{SHFT CLR}{3 CRSR DNs}":GOTO198Ø
244Ø SO=54272:FORCL=SOTOSO+24:POKECL,Ø:NEXT
245Ø POKESO+24,15:POKESO+5,48:POKESO+6,248:
     POKESO+1,HF:POKESO+4,33
246Ø FORCL=1TO2ØØ:NEXTCL
247Ø POKESO+24,Ø:POKESO+4,32
248Ø RETURN
249Ø SO=54272:FORCL=SOTOSO+24:POKECL,Ø:NEXT
     CL
25ØØ POKESO+5,85:POKESO+6,85:POKESO+12,85:P
     OKESO+13,85:POKESO+24,15
251Ø POKESO+4,33:POKESO+11,17
252Ø FORI=1TO6:READH1,L1,H2,L2:POKESO+1,H1:
     POKESO,L1:POKESO+8,H2:POKESO+7,L2
253Ø IFH1=5ØTHENFORCL=1TO2ØØ:NEXTCL
254Ø FORCL=1TO1ØØ:NEXTCL:NEXTI
255Ø POKESO+4,32:POKESO+11,16:FORCL=1TO5ØØ:
     NEXTCL:RESTORE:RETURN
256Ø DATA25,3Ø,18,2Ø9,33,135,25,3Ø,42,62,31
     ,165,5Ø,6Ø,37,162,42,62,31,165,5Ø,6Ø
257Ø DATA37,162
```


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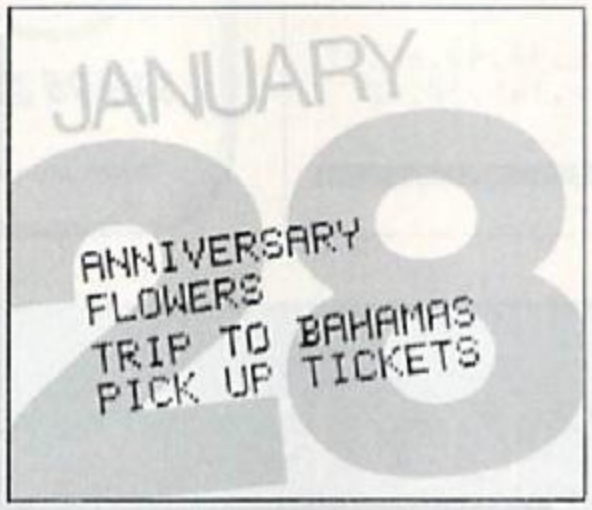
Don't Forget!

By RICHARD LOVETT

Here's the perfect program for people with a busy schedule and a bad memory. It lets you create an appointment file and has a built-in calendar as well.

Instant Memo allows you to enter up to three reminder memos for any day of the year, review or change them, and, if you have a printer, make a hard copy of one or more months' worth of entries. The program can also display an accurate calendar for any month between the years 1700 and 3099. Any day for which you've entered a memo will be highlighted in reverse video on the calendar, and you can print a hard copy of the calendar itself. (Free wall calendars are getting harder and harder to come by.)



Getting Started

After you type in and run Instant Memo, you will first see an introductory menu allowing you to load an existing file from disk or tape, create a new file or simply view a month's calendar. If you choose the calendar option, you will be returned to this menu after viewing the desired month.

Selecting the "new file" option sends you to the main Input routine in lines 150–360. Here you specify a day, and then view, enter or delete any desired memos for that date. (Memos can be up to 77 characters long, although they will display more neatly if kept under 40 characters. Don't use any commas, colons, semicolons or quote marks.) To select a day, you first enter the month as a number between 1 and 12, then the day and year. Use all four digits of the year.

Actually, specifying the year does not prevent a memo entered for, say, July 4, 1984, from also being displayed if you call up July 4 of some other year. Making each day of several years entirely separate would have required dimensioning the arrays in line 10 several times larger, thus quickly exhausting the computer's memory. Putting an "84," "85" or other designation at the end of entries from different years is an easy way to overcome any confusion. Entering the year *does* govern whether or not you can enter or

Line	Description
5–45	Dimension arrays, print title page
50–100	Load an existing file
105–145	Main menu
150–190	Input desired date
195	Determines Julian value (1–366) of date
200	Reserves 60th day of year for Feb. 29
205–260	Display a date and memos, ask for choice of action
265–335	Routine to enter a memo
340–360	Routine to delete a memo
365–380	Subroutine to determine part of formula for printing calendar
385–710	Calculate and display a month's calendar
715–785	Print out a month's memos
790–855	Review a month's memos on screen
860–925	Save the file
940–1005	Screen dump to print copy of calendar

Table 1. *Instant Memo program description.*

RUN It Right

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Printer (optional)

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— Jim Stephens, RUN

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— David Florence, COMPUTE'S Gazette

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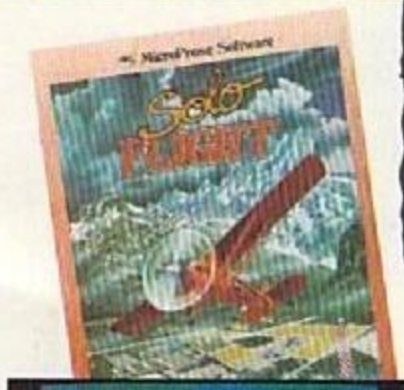
— Jim Bumpas, BUMPAS REVIEWS



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view a memo for Feb. 29, which only occurs in leap years.

The main menu in lines 105–145, accessible from most other modes of the program, includes options to view a month's entries on the screen, view more calendar pages or save the file to tape or disk.

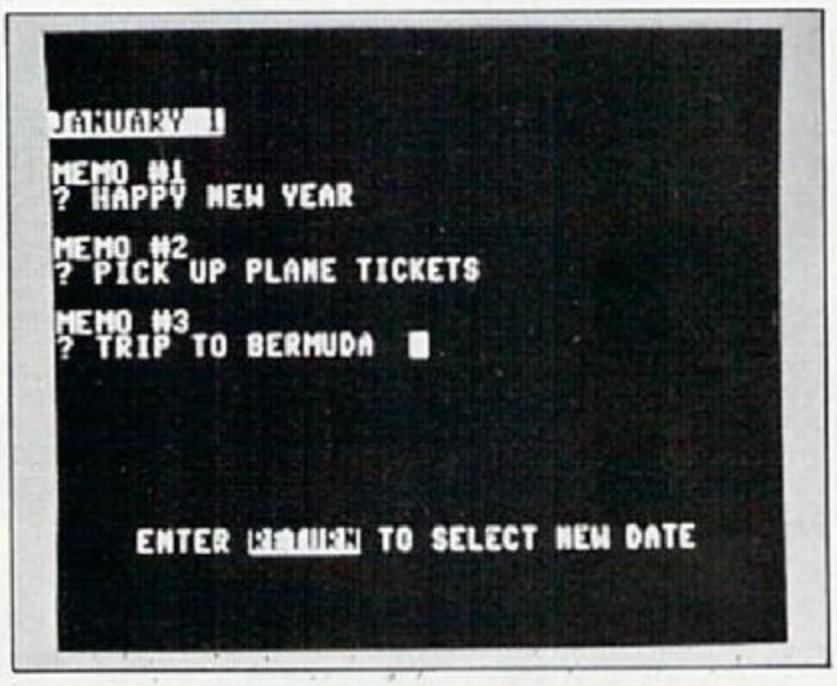
Is Today the 6th?

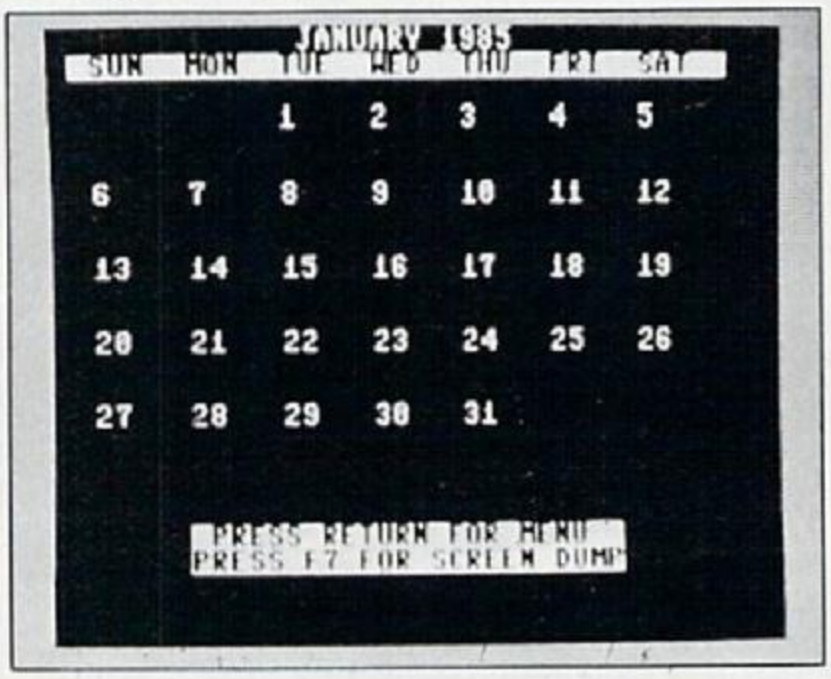
Lines 385–710 compute and display the calendar. Line 420 reads in the name of the month and its length in days. Then the formula in lines 430–480 determines which day of the week the first of that month falls on. Using that day as the starting point, lines 500–670 Poke the dates on the screen and highlight any days containing memos.

A modified screen dump in lines 940–1005 prints a hard copy of the calendar. A screen dump is a routine that sends the contents of the screen to a printer or other device. Because the upper limit of LI in line 950 is 19, however, the routine will reproduce only the top 19 screen lines. This avoids cluttering up the printout with the prompts at the bottom of the screen.

If you'd rather not type in the listing, send me a blank disk or cassette, $3 and a self-addressed, stamped mailer, and I'll send you a copy of the program. Ⓡ

Address all author correspondence to Richard Lovett, 6649 Oak St., Kansas City, MO 64113.




SUN MON TUE WED THU FRI SAT
1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31
PRESS RETURN FOR MENU
PRESS F7 FOR SCREEN DUMP

Listing 1. *Instant Memo program for the C-64.*

```
5 POKE53281,Ø:PRINT"{CTRL 8)":REM SETS SCRE
  EN, TEXT COLORS
1Ø DIMA1$(366),A2$(366),A3$(366)
15 PRINT"{SHFT CLR}":FORI=1TO4Ø:PRINT"{SHFT
   R}";:NEXT:FORI=1TO5Ø:PRINT"{CTRL 9} ";:
  NEXT
2Ø PRINT"{CTRL 9}** INSTANT MEMO **";
25 FORI=1TO52:PRINT"{CTRL 9} ";:NEXT:FORI=1
  TO4Ø:PRINT"{CTRL Ø}{SHFT E}";:NEXT
3Ø PRINT"{CTRL Ø}{3 SPACEs}{3 CRSR DNs}SELE
  CT ONE:":Z=1:PRINT"{3 SPACEs}{1Ø COMD Ts
  }"
35 PRINTTAB(5)"{CRSR DN}{CTRL 9}1{CTRL Ø} L
  OAD OLD FILE":PRINTTAB(5)"{CRSR DN}{CTRL
   9}2{CTRL Ø} CREATE NEW FILE
4Ø PRINTTAB(5)"{CRSR DN}{CTRL 9}3{CTRL Ø} V
  IEW CALENDAR
45 INPUT"{2 CRSR DNs}";A:ONAGOTO5Ø,15Ø,385
5Ø PRINT"{SHFT CLR}{3 CRSR DNs} FROM {CTRL
  9}T{CTRL Ø}APE OR {CTRL 9}D{CTRL Ø}ISK";
  :INPUTAN$:IFAN$="D"THEN65
55 IFAN$<>"T"THEN5Ø
6Ø PRINT"{2 CRSR DNs}INSERT FILE TAPE.":OPE
  N4,1,Ø,"MEMO FILE":GOTO8Ø
65 PRINT"{2 CRSR DNs}INSERT SEQUENTIAL FILE
   DISK.":PRINT"PRESS A KEY WHEN READY."
7Ø GETJ$:IFJ$=""THEN7Ø
75 PRINT"{SHFT CLR}{2 CRSR DNs}LOADING FILE
  .":OPEN4,8,8,"Ø:MEMO FILE,S,R"
8Ø FORD=1TO366:INPUT#4,A1$(D):INPUT#4,A2$(D
  ):INPUT#4,A3$(D)
85 IFA1$(D)="{PI}"THENA1$(D)=""
9Ø IFA2$(D)="{PI}"THENA2$(D)=""
95 IFA3$(D)="{PI}"THENA3$(D)=""
1ØØ NEXT:CLOSE4
1Ø5 REM MAIN MENU
11Ø Z=Ø:PRINT"{SHFT CLR}{3 SPACEs}{3 CRSR D
  Ns}SELECT ONE:":PRINT"{3 SPACEs}{1Ø COM
  D Ts}"
115 PRINTTAB(5)"{CRSR DN}{CTRL 9}1{CTRL Ø}
  VIEW THE CALENDAR
12Ø PRINTTAB(5)"{CRSR DN}{CTRL 9}2{CTRL Ø}
  VIEW/ADD/DELETE A MEMO
125 PRINTTAB(5)"{CRSR DN}{CTRL 9}3{CTRL Ø}
  VIEW A MONTH
13Ø PRINTTAB(5)"{CRSR DN}{CTRL 9}4{CTRL Ø}
  PRINT OUT A MONTH
135 PRINTTAB(5)"{CRSR DN}{CTRL 9}5{CTRL Ø}
  SAVE FILE
14Ø PRINTTAB(5)"{CRSR DN}{CTRL 9}6{CTRL Ø}
  END PROGRAM
145 INPUT"{CRSR DN}";T:ONTGOTO385,15Ø,79Ø,7
  15,86Ø,93Ø:IFT>6THEN145
15Ø M1$="":Z=Ø:RESTORE:PRINT"{SHFT CLR}{2 C
  RSR DNs}{CTRL 9} VIEW, ADD OR DELETE A
  MEMO {CTRL Ø}
155 PRINT"{3 CRSR DNs}(ENTER {CTRL 9}RETURN
  {CTRL Ø} FOR MENU)
16Ø PRINT"(ENTER 'C' FOR CALENDAR)":INPUT"{
  2 CRSR DNs}MONTH (1 TO 12)";M1$
165 IFM1$=""THEN1Ø5
17Ø IFM1$="C"THEN385
175 M1=VAL(M1$)
18Ø IFM1>12ORM1<1THENPRINT"{CRSR DN}INVALID
  . TRY AGAIN.":FORI=1TO12ØØ:NEXT:GOTO15Ø
185 INPUT"{CRSR DN}DAY";D1:INPUT"{CRSR DN}Y
  EAR";Y:Y$=STR$(Y):IFLEN(Y$)=5THEN195
19Ø PRINT"{CRSR DN}USE ALL 4 DIGITS":GOTO18
  5
195 D=INT((M1-1)*3Ø.42)-(M1=2)+(M1>2ANDM1<8
  )-(M1>2ANDINT(Y/4)*4=Y)+D1
2ØØ IFY/4<>INT(Y/4)ANDD>59THEND=D+1
2Ø5 FORI=1TO12:READMO$,MJ,M,R:IFI=M1THEN215
21Ø NEXT
215 IFY/4-INT(Y/4)=ØANDD1<3ØTHEN225
22Ø IFD1>MTHENPRINT"{CRSR DN}NOT THAT MANY
```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Listing Continued

```
    DAYS IN THE MONTH":FORI=1TO15ØØ:NEXT:GO
    TO15Ø
225 PRINT"{SHFT CLR}{3 CRSR DNs}{CTRL 9}"MO
    $;D1"{2 CRSR DNs}"
23Ø PRINT"{CTRL 9}1{CTRL Ø} "+A1$(D)+CHR$(1
    3)+"{CRSR DN}{CTRL 9}2{CTRL Ø} "+A2$(D)
    +CHR$(13)+"{CRSR DN}{CTRL 9}3{CTRL Ø} "
    +A3$(D)
235 PRINT"{2 CRSR DNs}{CTRL 9}A{CTRL Ø}DD,
    {CTRL 9}D{CTRL Ø}ELETE, {CTRL 9}N{CTRL
    Ø}EXT OR {CTRL 9}M{CTRL Ø}ENU";
24Ø D$="":INPUTD$:IFD$=""THEN15Ø
245 IFLEFT$(D$,1)="M"THEN1Ø5
25Ø IFLEFT$(D$,1)="N"THEN15Ø
255 IFLEFT$(D$,1)="D"THEN34Ø
26Ø IFLEFT$(D$,1)<>"A"THEN235
265 I1$="":I2$="":I3$="":IFA1$(D)=""THEN275
27Ø GOTO295
275 PRINT"{SHFT CLR}{3 CRSR DNs}{CTRL 9}"MO
    $;D1;"{CTRL Ø}":POKE211,4:POKE214,21
28Ø PRINT"{CRSR UP}ENTER {CTRL 9}RETURN{CTR
    L Ø} TO SELECT NEW DATE"
285 POKE211,Ø:POKE214,6:INPUT"{CRSR UP}MEMO
     #1{CRSR DN}{7 CRSR LFs}";I1$:IFI1$<>""
    THENA1$(D)=I1$
29Ø IFI1$=""THEN15Ø
295 IFA2$(D)=""THEN3Ø5
3ØØ GOTO315
3Ø5 INPUT"{CRSR DN}MEMO #2{CRSR DN}{7 CRSR
    LFs}";I2$:IFI2$<>""THENA2$(D)=I2$
31Ø IFI2$=""THEN15Ø
315 IFA3$(D)=""THEN325
32Ø PRINT"{CRSR DN}THIS DATE FULL. {CTRL 9}
    D{CTRL Ø}ELETE, {CTRL 9}N{CTRL Ø}EXT, O
    R":PRINT"{CTRL 9}M{CTRL Ø}ENU";:GOTO24Ø
325 INPUT"{CRSR DN}MEMO #3{CRSR DN}{7 CRSR
    LFs}";I3$:IFI3$<>""THENA3$(D)=I3$
33Ø IFI3$=""THEN15Ø
335 GOTO32Ø
34Ø PRINT"{2 CRSR DNs}WHICH MEMO":INPUT"(1,
    2,3, OR {CTRL 9}N{CTRL Ø}ONE)";X$
345 IFX$="1"THENA1$(D)="":GOTO225
35Ø IFX$="2"THENA2$(D)="":GOTO225
355 IFX$="3"THENA3$(D)="":GOTO225
36Ø IFLEFT$(X$,1)="N"THEN1Ø5
365 C=Y1-YB:IFC=18ØØORC=22ØØORC=26ØØORC=3ØØ
    ØTHENCC=Ø:RETURN
37Ø IFC=17ØØORC=21ØØORC=25ØØORC=29ØØTHENCC=
    2:RETURN
375 IFC=2ØØØORC=24ØØORC=28ØØTHENCC=4:RETURN
38Ø IFC=19ØØORC=23ØØORC=27ØØTHENCC=5:RETURN
385 PRINT"{SHFT CLR}{2 CRSR DNs}{CTRL 9} DI
    SPLAY A CALENDAR {CTRL Ø}"
39Ø RESTORE:INPUT"{2 CRSR DNs}WHAT MONTH (1
     TO 12){2 SPACEs}";MO
395 IFMO>12THEN385
4ØØ INPUT"{CRSR DN}YEAR";Y1:YR$=STR$(Y1):S=
    Ø
4Ø5 IFLEN(YR$)<>5THENPRINT"{CRSR DN}ENTER A
    LL 4 DIGITS.":GOTO4ØØ
41Ø IFY1<17ØØTHENPRINT"{CRSR DN}I CAN'T GO
    THAT FAR{3 SPACEs}INTO THE PAST.":GOTO4
    ØØ
415 IFY1>3Ø99THENPRINT"{CRSR DN}I CAN'T GO
    THAT FAR{3 SPACEs}INTO THE FUTURE.":GOT
    O4ØØ
42Ø FORI=1TO12:READMO$,MJ,M,R:IFI=MOTHEN43Ø
425 NEXT
43Ø REM COMPUTE WHERE 1ST DAY FALLS
435 IFY1/4=INT(Y1/4)THEN64Ø
44Ø BB$=STR$(Y1):YB=VAL(RIGHT$(BB$,2)):GOSU
    B365
445 YY=(INT(YB*1Ø/8)+(CC+1+R))/7:VV=YY-INT(
    YY)
45Ø IFVV<.15ANDVV>.13THENS=Ø
455 IFVV<.3ØANDVV>.28THENS=5
46Ø IFVV<.44ANDVV>.42THENS=1Ø
465 IFVV<.58ANDVV>.56THENS=15
47Ø IFVV<.72ANDVV>.7ØTHENS=2Ø
475 IFVV<.87ANDVV>.85THENS=25
48Ø IFVV=ØTHENS=3Ø
485 REM CALENDAR HEADING
49Ø PRINT"{SHFT CLR}"TAB(13)MO$;Y1
495 PRINT" {CTRL 9} SUN{2 SPACEs}MON{2 SPAC
    Es}TUE{2 SPACEs}WED{2 SPACEs}THU{2 SPAC
    Es}FRI{2 SPACEs}SAT{2 SPACEs}{CTRL Ø}"
5ØØ REM POKE DATES ON SCREEN
5Ø5 N=1146:C=55418:NN=49:E=MJ+1:A=128:FORE=
    ETOE+8:POKEN+S,NN:POKEC+S,7
51Ø IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S,NN+A:POKEC+S,7
515 GOSUB665:NN=NN+1:NEXT:NN=48:E=MJ+1Ø:FOR
    E=ETOE+9:POKEN+S,49:POKEC+S,7
52Ø IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S,177:POKEC+S,7
525 POKEN+S+1,NN:POKEC+S+1,7
53Ø IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S+1,NN+A:POKEC+S+1,7
535 GOSUB665:NN=NN+1:NEXT
54Ø E=MJ+2Ø:NN=48:FORE=ETOE+8:POKEN+S,5Ø:PO
    KEC+S,7
545 IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S,178:POKEC+S,7
55Ø POKEN+S+1,NN:POKEC+S+1,7
555 IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S+1,NN+A:POKEC+S+1,7
56Ø GOSUB665:NN=NN+1:NEXT:IFM=28THEN675
565 E=MJ+29:POKEN+S,5Ø:POKEC+S,7
57Ø IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S,178:POKEC+S,7
575 POKEN+S+1,57:POKEC+S+1,7
58Ø IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S+1,185:POKEC+S+1,7
585 GOSUB665:IFM=29THEN675
59Ø E=MJ+3Ø:POKEN+S,51:POKEC+S,7
595 IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S,179:POKEC+S,7
6ØØ POKEN+S+1,48:POKEC+S+1,7
6Ø5 IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S+1,176:POKEC+S+1,7
61Ø GOSUB665:IFM=3ØTHEN675
615 E=MJ+31:POKEN+S,51:POKEC+S,7
62Ø IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S,179:POKEC+S,7
625 POKEN+S+1,49:POKEC+S+1,7
63Ø IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPOKEN+S+1,177:POKEC+S+1,7
635 GOSUB665:GOTO675
64Ø IFY1/1ØØ<>INT(Y1/1ØØ)THEN65Ø
645 IFY1/4ØØ<>INT(Y1/4ØØ)THEN44Ø
65Ø IFMO=1THENM=31:R=R-1:GOTO44Ø
655 IFMO=2THENM=29:R=R-1:GOTO44Ø
66Ø GOTO44Ø
665 S=S+5:IFN+S=118ORN+S=13Ø1ORN+S=142ORN
    +S=154ORN+S=166THENS=S+85
67Ø RETURN
675 POKE211,7:POKE214,21:PRINT"{CRSR UP}{CT
    RL 9} PRESS RETURN FOR MENU{2 SPACEs}"
68Ø IFZ<>1THENPRINTTAB(7)"{CTRL 9}PRESS F1
    TO ENTER MEMO{2 SPACEs}{CTRL Ø}
685 PRINTTAB(7)"{CTRL 9}PRESS F7 FOR SCREEN
     DUMP{CTRL Ø}
69Ø GETJ$:IFJ$=""THEN69Ø
695 IFASC(J$)=133THEN15Ø
7ØØ IFASC(J$)=136THEN94Ø
7Ø5 IFZ=1THEN15
```

→

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Listing Continued

```
71Ø GOTO1Ø5
715 RESTORE:PRINT"{SHFT CLR}{2 CRSR DNs}{CT
    RL 9}PRINT OUT A MONTH {CTRL Ø}
72Ø INPUT"{2 CRSR DNs}WHAT MONTH (1 TO 12)"
    ;MO
725 FORI=1TO12:READMO$,MJ,M,R:IFI=MOTHEN735
73Ø NEXT
735 PRINT"{3 CRSR DNs}TURN ON PRINTER.":PRI
    NT"{CRSR DN}HIT A KEY WHEN READY.
74Ø PRINT"{2 CRSR DNs}PRESS {CTRL 9}RETURN{
    CTRL Ø} TO RETURN TO MENU.
745 GETJ$:IFJ$=""THEN745
75Ø IFJ$=CHR$(13)THEN1Ø5
755 OPEN4,4:PRINT#4,CHR$(14)"MEMOS FOR ";MO
    $:PRINT#4,CHR$(15):E=MJ+1:F=1
76Ø FORE=ETOE+M-1
765 IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPRINT#4:PRINT#4,MO$;F;"--"
77Ø IFA1$(E)<>""THENPRINT#4,"{2 SPACEs}* "+
    A1$(E)
775 IFA2$(E)<>""THENPRINT#4,"{2 SPACEs}* "+
    A2$(E)
78Ø IFA3$(E)<>""THENPRINT#4,"{2 SPACEs}* "+
    A3$(E)
785 F=F+1:NEXT:FORI=1TO4:PRINT#4:NEXT:CLOSE
    4:GOTO1Ø5
79Ø RESTORE:PRINT"{SHFT CLR}{CTRL 9}{2 CRSR
     DNs}VIEW A MONTH {CTRL Ø}
795 INPUT"{2 CRSR DNs}WHAT MONTH (1 TO 12)"
    ;MO
8ØØ FORI=1TO12:READMO$,MJ,M,R:IFI=MOTHEN81Ø
8Ø5 NEXT
81Ø G=Ø:E=MJ+1:F=1:IFM=28THENM=29
815 PRINT"{SHFT CLR}":FORE=ETOE+M-1
82Ø IFA1$(E)<>""ORA2$(E)<>""ORA3$(E)<>""THE
    NPRINT"{3 CRSR DNs}{CTRL 9}"MO$;F"{CTRL
     Ø}":PRINT:G=1
825 IFA1$(E)<>""THENPRINT" "+A1$(E)
83Ø IFA2$(E)<>""THENPRINT" "+A2$(E)
835 IFA3$(E)<>""THENPRINT" "+A3$(E)
84Ø F=F+1:IFG=ØTHEN855
845 PRINT"{2 CRSR DNs}"TAB(9)"{CTRL 9}HIT A
    NY KEY TO PROCEED{CTRL Ø}":G=Ø
85Ø GETJ$:IFJ$=""THEN85Ø
855 PRINT"{SHFT CLR}":NEXT:GOTO1Ø5
86Ø PRINT"{SHFT CLR}{2 CRSR DNs}{CTRL 9}SAV
    E FILE {CTRL Ø}
865 PRINT"{2 CRSR DNs} SAVE TO {CTRL 9}T{CT
    RL Ø}APE OR {CTRL 9}D{CTRL Ø}ISK";:INPU
    TAN$:IFAN$="D"THEN88Ø
87Ø IFAN$<>"T"THEN86Ø
875 PRINT"{2 CRSR DNs}INSERT FILE TAPE.{CRS
    R DN}":OPEN4,1,1,"MEMO FILE":GOTO9ØØ
88Ø PRINT"{2 CRSR DNs}INSERT SEQUENTIAL FIL
    E DISK.":PRINT"PRESS A KEY WHEN READY."
885 GETJ$:IFJ$=""THEN885
89Ø PRINT"{SHFT CLR}{2 CRSR DNs}SAVING FILE
    .":OPEN15,8,15:PRINT#15,"SØ:MEMO FILE"
895 CLOSE15:OPEN4,8,8,"Ø:MEMO FILE,S,W"
9ØØ FORD=1TO366:IFA1$(D)=""THENA1$(D)="{PI}
    "
9Ø5 PRINT#4,A1$(D):IFA2$(D)=""THENA2$(D)="{
    PI}"
91Ø PRINT#4,A2$(D):IFA3$(D)=""THENA3$(D)="{
    PI}"
915 PRINT#4,A3$(D):NEXT
92Ø PRINT"{2 CRSR DNs}ONE MORE MINUTE, PLEA
    SE."
925 PRINT#4:CLOSE4:FORD=1TO366:GOTO85
93Ø INPUT"{SHFT CLR}{2 CRSR DNs}DID YOU SAV
    E YOUR DATA (Y/N)";AN$:IFAN$<>"Y"THEN86
    Ø
935 END
94Ø REM SCREEN DUMP ROUTINE
945 G1$=CHR$(145):OPEN 4,4:PRINT#4:G1=984
95Ø FORLI=1TO19:GØ$=G1$:G1=G1+4Ø:REM LI=NO.
     OF SCREEN LINES TO BE PRINTED
955 FORG2=G1 TO G1+4Ø:G3=PEEK(G2)
96Ø IFG3>128THENG3=G3-128:G4=1:GØ$=GØ$+CHR$
    (18)
965 IF(G3>Ø)*(G3<32)THENG3=G3+64:GOTO 985
97Ø IF (G3>31)*(G3<64)THEN 985
975 IF (G3>63)*(G3<96)THEN G3=G3+128:GOTO 9
    85
98Ø IF (G3>95)*(G3<128)THEN G3=G3+64:GOTO 9
    85
985 GØ$=GØ$+CHR$(G3)
99Ø IF G4=1THEN GØ$=GØ$+CHR$(146):G4=Ø
995 NEXT:PRINT#4,GØ$:NEXT
1ØØØ PRINT#4:CLOSE4:IFZ=1THEN15
1ØØ5 GOTO1Ø5
1Ø1Ø DATA JANUARY,Ø,31,3,FEBRUARY,31,28,6,M
    ARCH,6Ø,31,6,APRIL,91,3Ø,2
1Ø15 DATA MAY,121,31,4,JUNE,152,3Ø,Ø,JULY,1
    82,31,2,AUGUST,213,31,5
1Ø2Ø DATA SEPTEMBER,244,3Ø,1,OCTOBER,274,31
    ,3,NOVEMBER,3Ø5,3Ø,6
1Ø25 DATA DECEMBER,335,31,1
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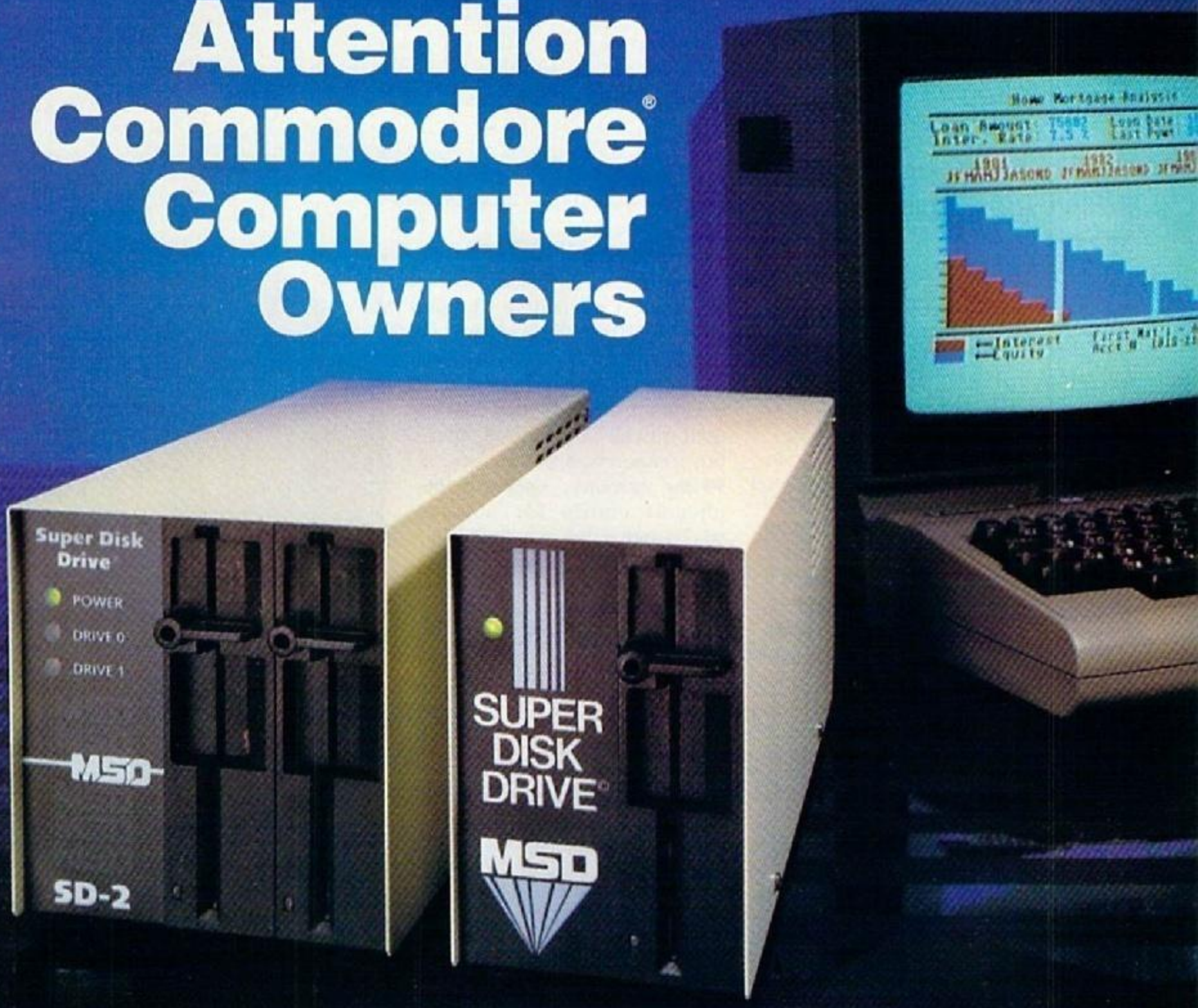

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Selecting The Right Printer

By JIM STRASMA

You can't always tell which printer is right for you simply by its shape or color. This article takes a look at some of the available printers and their accessories, so you'll be better informed to choose the equipment that best meets your needs.

A printer is perhaps the most useful peripheral you can own. In a few minutes, it can generate a printout (often called hard copy) of information you have entered onto the screen. However, making such a convenient device work with your computer can be a real headache if you don't choose the proper printer/interface combination to work with your computer.

Let's take a look at some of the available printers and their accessories.

Commodore Printers

The following Commodore printers are from Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380; 215-431-9000. They use a dot-matrix print head (except for the 1520), they may be used with all Commodore serial-bus computers, and they have a 90-day warranty. They are the obvious choice for anyone who'd rather not mess with interfaces and option switches.

1520 Plotter. This small unit is both a printer and a four-color plotter. Although it uses only 4-inch paper, it still prints up to 80 columns of text, as well as larger letters and highly detailed graphics, all in a choice of colors. If you don't mind using narrow paper, the 1520's only negative aspect is that it doesn't use device 4 like other printers. As a result, some applications programs don't recognize it. *(Approximately $200.)*

1525e. This is a bit larger than the former model 1515, but much quieter

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and more attractive. Unlike its predecessor, it handles normal size (9½ × 11) computer paper, as long as the paper lies directly behind the printer and not below it. It will not, however, handle anything heavier, not even fan-fold checks, despite its adjustable pin feed.

The print quality is surprisingly good, considering the printer has only a single print hammer, but it proceeds at a slow 30 cps and is quite noisy. The 7 × 6 dot matrix prints all Commodore graphics, but lacks descenders. It also lacks the formatted print of the 1526 below, but adds a nice graphics bit-mapping option (480 dots/line). A switch sets the printer to either device 4 or 5, but there is no connector for another printer. Construction is lightweight, to say the least, but it's still a good printer for the price.

Those without a red "E" on the side of the box won't work with the 64. Recommended for VIC owners. *(Approximately $225.)*

1526. This printer has been a mixed bag for Commodore. On the one hand, it is clearly faster than the 1525, at 60 cps with bidirectional printing. It includes true descenders (the long letters like y, g and q drop below the print line properly), uses an 8 × 8 dot matrix and has both friction feed and rear tractors. It is rumored to be an Epson MX-70 with different electronics, which speaks fairly well for its construction.

On the other hand, the 1526 is *not* software compatible with the 1525 and does *not* work with applications programs that use all the features of the 1525. A few now explicitly include a 1526 option, but many still don't. Also, if it has any graphics capabilities, they are well hidden. The film ribbon gives good print quality, but has a short life. There also still seem to be some residual incompatibilities with older systems that use multiple disk drives, despite a recall last year.

It is surprising to note everything the 1526 *cannot* do, including underlining, italics, subscripts, superscripts, boldface, condensed print and custom character sets. At least it can do expanded characters and variable spacing between lines. It also includes the formatted print option of the larger Commodore printers, which can somewhat replace the Print Using command on those models that lack it.

On balance, the 1526 does more of what I need than the 1525 and the 801, and it's more suited to heavy use than Commodore's other serial-bus printers, but I'd be less likely to buy it than either an MPS 801 or a full-featured non-Commodore printer. *(Approximately $250.)*

MPS-801. This is an upgraded 1525, with a much sleeker case, a cartridge ribbon and higher print speed. I've been tempted to buy one several times over the past few months, merely to have an official Commodore printer again, but haven't quite put the money down. It is a good dollar value—one of the cheapest "real" printers on the market, though still clearly designed for light home use, not continuous operation or multipart forms at the office. Its manual is also clear, concise and accurate, a pleasant change for Commodore. Its only unexpected problem is slight incompatibility with the VIC, a problem VIC owners have avoided by saving programs to disk before listing them. Recommended for all but VIC owners. *(Approximately $250.)*

Also in this issue, *RUN* takes a look at Commodore's newest printers—the DPS 1101 and the 803.

Dot-Matrix Printers

Several leading printers have been evaluated by Cardco Inc. for use with their "+G" graphics printer interface. Ed Lippert, president of Cardco, supplied these ratings to the *Midnite Software Gazette* (listed in order of his preference):

Prowriter. It is sold as the C. Itoh 8510 and NEC 8023 (best overall). *Good points*: Fast graphics, *excellent* print quality, very reliable, rear tractor feed. *Bad points*: Complicated internal DIP switches.

Mannesmann Tally Spirit (best buy). *Good points*: Excellent print quality, rear tractor, Epson-code compatible. *Bad points*: Tractor mechanism binds occasionally.

Okidata, 82 and 92 series. *Good points*: Good print quality, very reliable. *Bad points*: Non-standard printer codes, 7-bit graphics (prefer 8-bit).

Epson, MX, RX and FX series. *Good points*: Good reliability, good print quality, standardized special printer codes. *Bad points*: Non-standard width graphics characters, slow graphics printing unless a print buffer is used.

Gorilla Banana (good value, but may be hard to locate). *Good points*: Exactly duplicates Commodore 1525, 40% faster than the 1525. *Bad points*: 30% slower than most printers, fair print quality, no descenders, 7-bit graphics (prefer 8-bit), fair reliability.

Star Gemini 10X/15X. *Good points*: Good print quality, Epson compatible. *Bad points*: Fair reliability, slow graphics printing unless a print buffer is used, non-standard width graphics characters.

The following printers work with the "+G" but were not rated by Cardco: Panasonic, Inforunner Riteman, Star Delta 10, BMC and Mannesmann Tally 160.

Following are reviews of two of the above printers that I have used. Both are available with either a Centronics parallel or an RS-232 interface, and both connect to Commodore printers via an interface.

Gemini 10X. This is one of the best Epson clones, using the same command set and matching the FX series feature by feature, but at a lower price.

My personal favorite feature is not universally appreciated; the Gemini uses standard Underwood spool ribbons that can be bought at office-supply stores everywhere for about $2, instead of the typical $14 you'd pay for an Epson cartridge. On the other hand, installing the spool is a messy and memorable experience, whereas cartridges just snap in. Mechanically, the Gemini shares the Epson's 9 × 9 dot matrix and has a similar (but cheaper) disposable print head.

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Other attractive features include a completely user-definable character set, a 1K built-in print buffer and bidirectional, logic-seeking printing at 120 cps (although it doesn't seem that fast in actual use). It also includes a friction feed that works without skewing the paper, as well as a removable tractor feed. Although the 10X has a 10-inch carriage, a similar 15X model is available with a wider carriage. Those needing higher speed may want to try Gemini's Delta models, which offer 180 cps. Earlier models (without the "X") are unable to mix text and graphics on the same line.

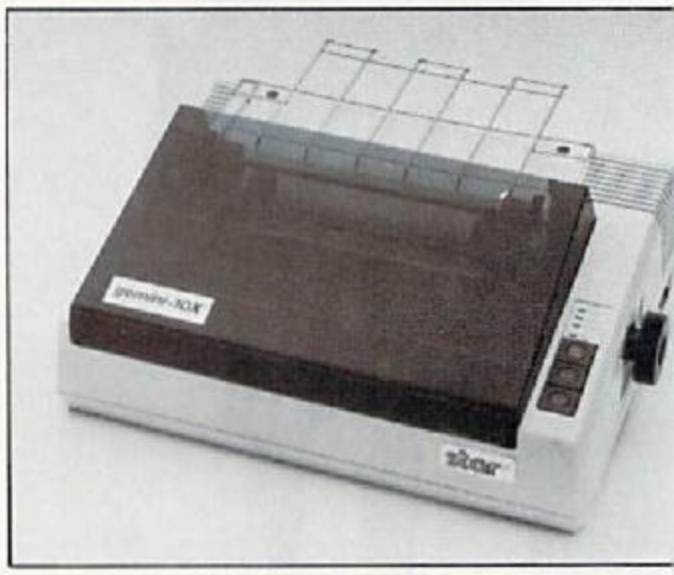
The 10X's print features include everything you'd expect: pica, elite and condensed type; boldface and emphasized print; italics; true descenders and underlining; and high-resolution graphics.

I've used the 10X on two book projects and found it quite adequate for our needs, with good print quality. Its only negative feature is that, like the Epson, it slows down markedly on graphics output, unless connected via an interface with a built-in print buffer. Fortunately, such interfaces are now readily available. Recommended. *(Approximately $350 from Star Micronics, 200 Park Ave., New York, NY 10166. Six-month warranty.)*

Prowriter 8510, also sold as the NEC 8023. This is my personal printer, the one I use daily. Nearly any printer can turn out attractive text with a fresh ribbon, but the Prowriter continues to do so months later. After a year of use, it's only on its third ribbon cartridge, and the first two are still usable.

Compared to the Gemini 10X, reviewed above, the Prowriter has the same 120 cps speed, but seems to have a higher actual print speed. It lacks the ability to download a complete character set and to do italics, but it includes full Greek and Japanese character sets and true proportional spacing. To minimize paper waste, the printer's adjustable pin feed is mounted in the rear, a minor convenience. We've had no problems with slippage from the rear tractors, although the friction feed seems a bit weak. The Prowriter is compact and cleanly designed, and strong enough to print cards and multipart forms.

Other features are, as in the Gemini: a 9×9 dot matrix; bidirectional logic-seeking printing; a 2K print buffer; boldface and expanded print; true descenders and underlining; pica, elite and condensed type and excellent high-resolution graphics. Those needing either a wider carriage than the standard 10½ inches or a higher print speed will find C. Itoh has other suitable models available, including a new color printer (not tested).



The Prowriter comes with two manuals—one typical complex manual that describes *everything* and fairly well, and another that almost anyone can read.

The lack of a user-definable character set and the unfortunate placement of 16 tiny but important switches deep inside the print compartment are the only negative features I've noticed about this printer. You can reach the switches by lifting off the front cover, but seeing them may require a flashlight. Although some will be bothered by its having control codes and graphics that differ from the many Epson clones, I have easily found quality programs that explicitly support the 8510. Highly recommended. *(Approximately $400 from C. Itoh 5301 Beethoven St., Los Angeles, CA 90066; 213-306-6700; one-year warranty.)*

Hush 80. This 80-column portable thermal dot-matrix printer operates at 80 cps (bidirectional printing). It is only 25 ounces, making it the lightest portable printer. It has a 6×7 dot matrix.

The printer is offered in three models, each of which can be equipped with a built-in, rechargeable nickle-cadmium battery pack as an option. The model Hush 80CD ($139.99 complete with interface and cable) provides direct interfacing to Commodore computers. The Hush 80P ($139.99 without cable) is a Centronics-type parallel interface version, while the Hush 80S ($139.99 without cable) provides a serial RS-232 interface.

All Hush 80 models include a 100-foot roll of thermal paper loaded ready for use and a 9-volt ac wall transformer with power cable. *(Ergo Systems Inc., 26254 Eaton Landing Road, Hayward, CA 94545. Six-month limited warranty.)*

Daisywheel Printers

The field of daisywheel printers is changing rapidly; the following two reviews are only a tiny sample of the range available.

Dynax DX-15. This low-cost daisywheel printer, available in parallel and RS-232 versions, uses widely available Diablo ribbon cartridges. It also does underlining, superscripts and subscripts and boldface, and it prints bidirectionally at 12 cps. Its $250 optional single-sheet feeder works well, as does the $250 dual tractor feed and an optional $200 remote keyboard. The Dynax is big (15-inch carriage) and solidly built—it can run all day without trouble. Recommended. *(Reviewed by Jim Oldfield. Approximately $500 from Brother Electronics; one-year warranty.)*

Printmaster. This is a 55-cps version of the popular Starwriter F-10 daisywheel. Sheet feeder optional. A stencil option allows printing six (instead of three) copies at once. It also adds two-color ribbon capability and has room for a 2K print buffer on board by adding an $11 chip. The RS-232 version allows up to 9600 baud. It is far lighter, quieter while printing and less expensive than the Starwriter 25 it replaced.

It includes a whisper fan, which is

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Santa Cruz, CA

The Commodore User's Group of Santa Cruz meets on the third Tuesday of every month from 7:00–9:00 PM, at the Louden Nelson Center in Santa Cruz.

The club helps new users of Commodore computers and offers advice on any member's hardware or software problems. At present, the group requires no membership dues.

For information, contact the Commodore User's Group of Santa Cruz, PO Box 8068, Santa Cruz, CA 95061-8068, 408-335-2082 or 408-476-0294.

Lueneburg, Germany

Interface Computer Club is a German organization for VIC-20 and C-64 users. The group, which is based in Lueneburg, Germany, would like to contact Commodore clubs in other countries for software and information exchange.

For more information, contact Interface Computer Club, c/o Uwe Wenk, Hindenburgstr 98, D-2120 Lueneburg, West Germany.

Brooksville, FL

Anyone living in the Brooksville or Spring Hill areas and interested in Commodore computers can join the Commodore Brooksville User's Group (C*BUG), PO Box 1261, Brooksville, FL 33512, 904-799-5292.

Eldon, MO

The Commodore User's Club of the Ozarks can be reached through Morris Williams, 211 N. Aurora, Eldon, MO 65026, 314-392-4248.

New Castle, PA

The Castle Commodore Computer Club, serving VIC-20, C-64 and PET users, meets on the third Thursday of each month in New Castle, PA. For more information, contact Castle Commodore Computer Club, c/o Dean Thomas, RD #1, Box 210A, Edinburg, PA 16116, 412-652-3352.

Sierra Vista, AZ

Thunder Mountain Commodore Computer User Group is made up of more than 70 families and is open to anyone who is interested.

For more details, write Thunder Mountain Commodore Computer User Group, PO Box 1796, Sierra Vista, AZ 85636. The group may also be contacted on CompuServe, user ID #75115,41.

Altoona, PA

The Bellwood-Altoona Swappers in Commodore (Basic) recently formed. Meetings are held on the first Sunday of each month at 2:00 PM, at 1433 13th Ave., Altoona, PA.

For information, contact Dimitri Dantos, 515 E. 26th Ave., Altoona, PA 16601, 814-942-9565.

South Plains User Group

The South Plains 64 User Group can be contacted through John Bottoms Sr., 7709 Ave. W., Lubbock, TX 79423, 806-745-4381.

Compumania

Based in Saco, ME, Compumania was formed in March 1983 to promote computer literacy and generally to provide support for computer users.

The group, which is a general computer user's club, has a strong C-64 membership. Compumania offers members a public domain library and maintains a list of persons who offer support to members who need assistance with their computers.

For more information about the group, contact Compumania, c/o Richard Nadeau, 81 North St., Saco, ME 04072, 207-282-7418.

Akron, OH

Commodore Users in Akron, a recently formed Commodore user's group, offers open, biweekly meetings. For more information, write Commodore Users in Akron, PO Box 9243, Akron, OH 44305.

Chicago, IL

C-64 enthusiasts living in the Chicago area can join the C-64 User's Group, Inc. Each chapter meets monthly and members are invited to attend any or all of the meetings.

The group offers members a software library containing more than 500 programs, a newsletter and bulletin-board system.

Anyone interested can write the C-64 User's Group, Inc., PO Box 46464, Lincolnwood, IL 60646, or call Darrell Hancock, 312-588-0334, or David Tamkin, 312-583-4629.

Englewood, FL

Ram Rom 84 can be contacted through Nancy Kenneally, 1620 Morning Dove Lane, Englewood, FL 33533, 813-474-9450.

Wheeling, WV

Commodore Home User's Group (CHUG) was formed in January 1984. If you live in the Wheeling area and are interested, contact CHUG, c/o Alice Shipley, 81 Lynwood Ave., Wheeling, WV 26003, 304-242-8362, or call David Hoskins, 302-242-2605.

Uintah Basin, UT

The Uintah Basin Commodore User's Club meets on the second and fourth Thursdays of the month, in the Roosevelt City Police Building.

Any interested C-64 user can write Terry Hall, PO Box 1102, Roosevelt, UT 84066.

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somewhat disturbing but covers up the power-supply noise that bothered me on the F-10. The dual tractor feed, a $200 extra, is *very* well done. There is also a bottom paper-feed slot, though I don't use it. The option switches are now accessible near the front of the unit. However, the cover no longer simply swings up, as on the 25; removing it takes a good tug, and an interlock won't allow use without it. Also, changing from pica to elite is now done with a little DIP switch rather than the large switch on the 25. Fortunately, it is easy to add toggle switches for often-used functions.

The Printmaster is attractive and very well made. The preliminary manual omits the switch settings, but the distributor provided these immediately over a toll-free line. It presumably includes all the F-10 features, which are too numerous to list. (A trivial example: It includes not one but three Test modes, depending on which front-panel switch is pushed at start-up.) The printer uses Qume control codes and Diablo ribbons and print wheels, making it an industry-standard printer.

It would be hard to find a better daisywheel printer today at any price. The only reason to get a lesser printer for word processing is to save money. Highly recommended for all commercial uses, and home users may want to look into the two slower and cheaper models in the Starwriter line. Commercial users may also want the optional sheet feeder. *(Approximately $1500 from C. Itoh; one-year warranty.)*

Combination Typewriter/Printers

If you need a typewriter, some can now be connected to your computer. Here are reviews of two combination units.

AP400. This unit, which is fairly large and heavy, is fast (20 cps) when compared to other printer/typewriters, though slow when compared to printer-only daisywheels of equal cost. It has an excellent easy-to-use, heavy-duty keyboard (with dozens of keys) and uses a self-correcting lift-off tape for errors. Correction memory is 500 characters long, and pitches include 10, 12 and 15.

It includes format settings for forms, boldface and underlining, subscripts and superscripts, plus special characters, even centering and automatic carriage returns at word ends as you approach the right margin. Recommended, once you learn to use it. *(Reviewed by Karleen Dude. Approximately $1200 from Canon Electronics; 90-day warranty.)*

Selectone Typewriter. It's actually an Olivetti Praxis 30 typewriter, modified to interface to a computer via a Centronics parallel connector. Modifications are entirely hidden inside the typewriter, with only a 10-conductor cable peeking out the rear cooling vents.

The Selectone is fairly compact and lightweight, while still being a full KSR (keyboard send/receive) daisywheel printer. It includes a self-correcting lift-off ribbon with ten-character memory and extra characters for other languages. For $50 extra, you may substitute the Praxis 35, adding dual pitch and a bit more memory. As a typewriter, the Selectone performs somewhere between my old electric Smith-Corona and an old IBM Selectric. In features, it outdoes both, though a new Selectric would outclass it—for triple the price.

As a computer printer, it is entirely functional, though slow (6 cps). Backspacing and underlining are supported, but not boldface. Ribbons last 40,000 characters—about ⅓ as long as on larger daisywheels, and cost nearly as much. Print wheels are available in the usual array of typefaces, but they're no easier to change than on other brands. It's an excellent choice if you need a low-cost typewriter/printer. *(About $695 from Selectone Computer Products, 28301 Industrial Blvd., Hayward, CA 94545. $195 without typewriter.)*

Serial-Bus Parallel Interfaces

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dore printers can be used. The following are among the best interfaces I've tested for parallel printers. (For more information about printer interfaces, see "Bridging the Gap," p. 92, November 1984 *RUN*.)

Card/?B. Cardco's interfaces have changed the rules of the interface game. At half the cost of earlier interfaces, they do more than connect a Commodore to a parallel printer and translate PETSCII to ASCII. They also provide "pretty print" listings, converting unprintable Commodore graphics characters into meaningful symbols all printers can handle.

One improvement in the new "B" model over the original "A" model is a line-feed switch, to ease use with some printers. The only obvious problem is in powering the interface. On Centronics printers, interface power is supposed to be supplied by the printer. Since some don't, a cassette-port connector and wire is included to do the job, but there is no cassette connector on the SX64, and on the Cardco the cassette connector is required, even for printers that do supply power themselves.

The Card/?B is an excellent value for those with daisywheel printers. Recommended. *($59.95 from Cardco, 313 Mathewson, Wichita, KS 67214; 316-267-6525. Lifetime warranty.)*

Card/?+G. To the many features of the other Cardco interfaces, the "+G" adds one new and important feature—full emulation of Commodore printers on several non-Commodore models. This includes all graphics characters, cursor controls and special features, not just on one brand of printer, but on four major brands and all their clones at once.

To set any of the supported printers to emulate a Commodore 1525 is a matter of throwing a few switches. The only hard part is cutting a hole in the cover so you can get at them without removing four screws. You need access to these switches to turn off the emulation when running programs that don't need it, so you can use features your printer has that the 1525 lacks. Apart from this one design oversight, the "+G" is an excellent value. *($99.95 from Cardco, 313 Mathewson, Wichita, KS 67214; 316-267-6525. Lifetime warranty.)*

The Connection. This is a lot like the Cardco "+G" (though they were developed separately), but with one important advantage and one potential disadvantage.

The advantage is the built-in 2K print buffer. This speeds graphics printouts on Epson-compatible printers and holds up to about a full page of normal text, freeing your computer more quickly for other tasks after a printout. The disadvantage is that it must be ordered for a particular printer, and its ROM chip must be swapped if you change to a different type of printer.

Other advantages include automatic page advance, so listings don't extend over the tear line between pages, and an optional wider left margin for printouts you'll put in a notebook. Unfortunately, like the "+G," the Connection hides two of its important switches under the lower right corner of its label. Uncover them by removing the label from that corner. *($119 from Tymac Controls, 129 Main St., Franklin, NJ 07416; 201-827-4050.)*

Micrografix MW 350. Take everything you like about the Cardco/?+G and Tymac's Connection interfaces (reviewed above), and put them together in a new interface from the Connection's former distributors.

Besides apparently including all the features of its predecessors, the 350 also has a larger 4K print buffer, visible switches, a built-in reset, the best-built serial-bus connector I've ever seen, even helpful printed instructions right on the cover. I'm also fond of the single line feed the interface generates at power-up; it serves as a sure confirmation that all is well. The only thing I didn't like was the all-green manual, but Micro W assured me that that was a fluke, and current manuals are printed with black

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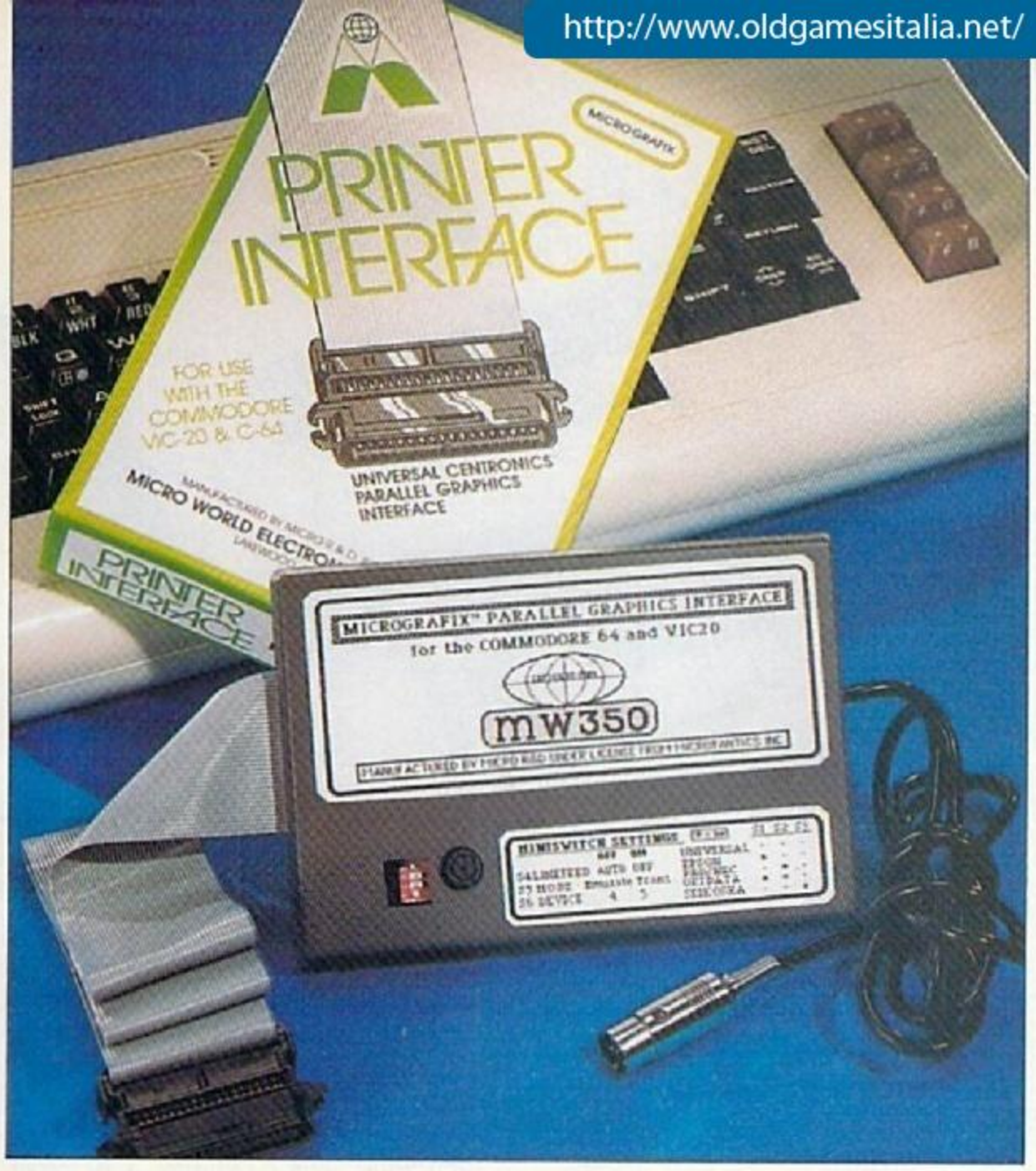

ink. Yes, it costs a bit more than others, but it may well be worth it. Highly recommended. *($130 from Micro W., 1342 B Rt. 23, Butler, NJ 07405; 201-838-9027. 90-day warranty. Also sold by Micro World Electronics.)*

Serial-Bus RS-232 Interface

And now, here's an interface for those using RS-232.

Interpod. Although primarily an IEEE-488 interface, the Interpod is the only RS-232 interface I've found that connects to the serial bus of Commodore computers. Although limited to the speed of the serial bus, it is the only IEEE-488 interface that works on the Plus/4 and C-16. This is because it is connected only via the serial bus, making it utterly independent of the computer.

Interpod's best feature may be its ease in connecting to RS-232 printers via the serial bus. Too few commercial programs support serial printers via the user port to risk buying one that connects there.

When the computer addresses a device, Interpod pauses to see if any device on the serial bus will answer. If not, the call is transferred to the IEEE bus, for a device to answer there. If not, and the device number is 4, it tries the RS-232 port. It ignores the IEEE device when a serial device is on and sharing the same device, or it can arrange another address for the RS-232 device.

The RS-232 port has all the usual setup options, plus unusual ones, like a true break, a delay after carriage returns and PETSCII-to-ASCII code conversion, controlled by sending commands to a command channel (secondary address 31). The command channel also sends an error status on request.

I found two problems. First, Interpod locks up if you turn the computer off and on without also turning off Interpod (a multi-plug switch solves this). Second, when rechecking IEEE disk status, Interpod adds garbage after the valid information. This causes some problems in data-handling programs. The cure is to send a Clear command to Interpod's command channel before each disk access.

Highly recommended to those with RS-232 printers. *($150 from Limbic Systems, 1056 Elwell Court, Palo Alto, CA 94303. Guaranteed compatible with all programs.)*

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Koala Muppet Learning Keys	60
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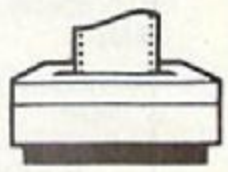

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Other Interfaces

If you need an IEEE-488 interface for your disk drive, the following two have features for your printer as well.

The Bus Card II. Transparent IEEE-488 and parallel interface, monitor and Basic 4 for the 64.

Although primarily an excellent IEEE-488 interface, the Bus Card includes an optional interface cable to a parallel printer that can convert PETSCII to ASCII if needed. The printer cable comes out of the Bus Card itself and doesn't require any connection elsewhere on the 64. Both the code translation and the printer connection itself are controlled by small but easily accessible switches on the front of the interface. I find Bus Card's printer interface adequate for most of my needs.

Highly recommended for those with an IEEE-488 disk drive. *($200 from Batteries Included, 186 Queen St. W., Toronto, Ontario M5V 1Z1, Canada; 416-596-1405. Transparent IEEE-488 and parallel interface, monitor and Basic 4 for the C-64.)*

C-64 Link. IEEE, RS-232, serial, parallel adapter with Basic 4 for 64; similar unit available for VIC.

The C-64 link is a capable IEEE-488 interface that offers optional cables to support RS-232 and parallel printers via the user port (for $50 each). It is hampered primarily by its inability to bank itself in and out of memory like the Bus Card above. This makes the Link incompatible with many of the fancier machine language programs, although it can sometimes be manually relocated with an included program to work with such products. An improved version that avoids this problem is rumored. Meanwhile, it remains the best choice for VIC owners, who buy it as the "V-Link." *($100 from Richvale Telecommunications, 10610 Bayview, Richmond Hill, Ontario L4C 3N8, Canada.)*

Accessories

No printer system would be complete without a few accessories. Here are reviews of a few I've found helpful.

Centronics 4-Position Transfer Switch. If you have several computers but only one printer, or several printers and one computer, this switch can help. It is a large rotary switch with one Centronics parallel input connector, enough contacts to handle all of its 36 pins and four output connectors to which the input connector can be linked, one at a time. It will prevent the wear that is normally caused from constant plugging and unplugging of cables and interfaces, and it will allow you to quickly connect any of four interfaces to your printer. The switch seemed overpriced at first, but I wouldn't solder together the maze of wires inside for less myself.

For those with other needs, Quill Corporation also sells a $115 version with only two output connectors, and both 2- and 4-output RS-232 transfer switches ($106 and $165, respectively). Unless you have a spare one lying around, don't forget to include an extension cable in your order; you'll need one to get from the transfer switch to the printer. A 5-foot Centronics cable

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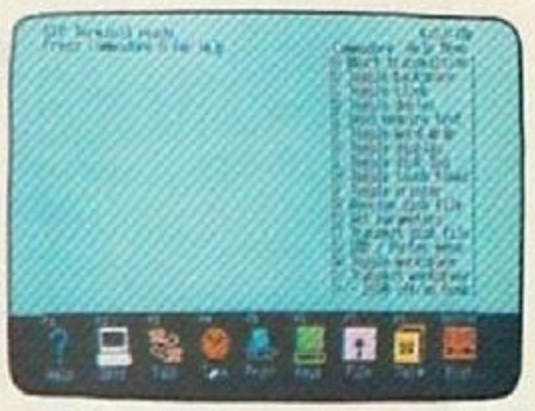

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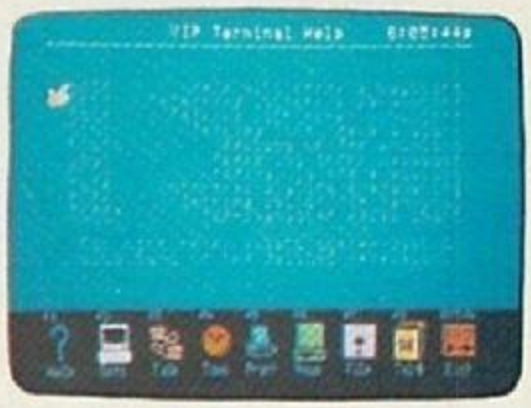

VIP Terminal makes full use of the potential of your C64 - you get color, graphics and sound. VIP Terminal uses menus and "icons," pictures of the tasks to be done. In fact, VIP Terminal can almost be totally controlled with a joystick. You can switch menus, change screen colors, change parameters, even dial your phone without ever touching your keyboard! Just move the hand to point to the colored icon, or the entry, press the fire button, and the change is made. Of course, it all can be done from the keyboard too!

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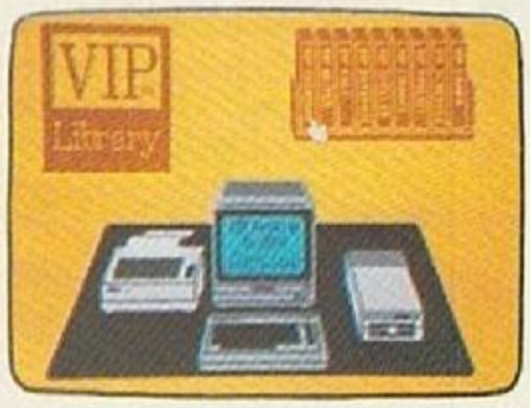

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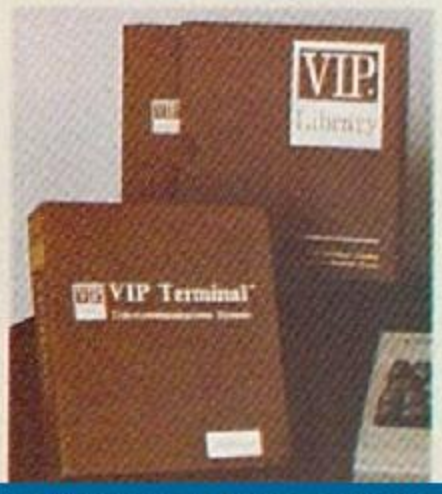

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costs $29 from Quill, and a 5-foot RS-232 25-pin cable costs $22. *($153 from Quill Corp., 100 S. Schelter Road, Lincolnshire, IL 60069; 312-634-4800. 30-day refund offer.)*

Model 5812 Printer Stand. A printer stand needs these simple features: a place to put the printer, a place to put the paper supply and something to catch the printer's output. Amazingly, Royal is the only company I've found that meets these requirements. Others let either the paper supply or the output lie on the floor.

The 5812-S, Royal's cheapest general-purpose stand, has a bottom feed slot and can feed from the rear. I added the 0640 facility compartment (to supply the paper), the 0885 mini-forms rack (to catch the output) and the 0099 locking casters. Assembly was easy. It's available in many looks; we chose black steel with a walnut-formica top. Ask a local dealer to order it. Mine was delivered in a week. Highly recommended. *(Approximately $165 [as set up above] from Royal Seating Corporation, Box 753, Cameron, TX 76520; 817-697-6421. For all printers. Price varies widely with options chosen.)*

Paper Tractor. This is a product of obvious value to those who possess printers that lack friction-feed and need to print single 8½-inch wide sheets of paper. It is a long sheet of flexible and durable clear plastic, with sprocket holes on the sides and slots for a sheet of paper on the front. It will hold sheets up to 14 inches long without difficulty, although it may not be long enough to keep the paper-out switch on some printers from triggering with 14-inch paper. If you need it, you'll be willing to pay the lofty asking price. Recommended. *($12 single-sheet holder for pin- and tractor-feed printers. From Paper Tractor, 1 S. Fairview, Goleta, CA 93117; 805-683-2851.)*

Serial-Bus Cable. This 6-pin DIN plug to 6-pin DIN plug cable (by Pfantone) is reasonably priced, and, unlike Commodore's own, is shielded. Its 6-foot length is generous compared to the approximately 3-foot standard ones, and shouldn't tax the driving power of the computer. (Fran Donovan at Warren Radio reports he's tested cables up to 35 feet long, and will sell them if needed.) This is another of those obvious products that many people need but no one seems to offer. Highly recommended. *($7 from Warren Radio, 800 SW Jefferson, Peoria, IL 61605; 309-674-5998.)*

TRS-80 Line Filter. I recommend hooking all of your computer's accessories into a single switch box and turning

Printer Features and Accessories

Most of today's printers are impact printers, that is, they produce printouts by striking an inked ribbon so that it hits (impacts) a piece of paper. Impact printers fall into one of two main groups—dot matrix and daisywheel—which differ in their means of ink distribution. Several other non-impact printers are also worthy of mention, including laser, ink jet, thermal transfer, thermal and electrostatic.

Dot-Matrix Printers

Dot-matrix printers are the most common. They are often cheap and fast, with readable, if unimpressive, output.

An electromagnet hammers a small pin into the end of a tiny wire, which in turn strikes an inked ribbon and the paper behind it. There is usually a whole row of these hammers and wires, lined up vertically. The row moves across the paper during printing, and each hammer may fire any time it passes a spot where a dot is needed. To keep track of things, all the locations in a single character are organized into a rectangular grid (matrix). The more dots there are within this matrix, the better will be the resulting print.

At a minimum, a 7×5 dot matrix is needed just to distinguish between characters, and most printers now use more dots. Each character on your computer screen is made up of an 8×8 dot matrix, and many of the better printers have even more, up to as many as 18×40 on some costly models. A 9×9 dot matrix gives a pleasing appearance, especially if the printer allows the same character to be struck twice for emphasis. Those printers offering such an option often refer to it as Correspondence mode, as opposed to their faster but less readable Draft mode. A few costly printers redo each line four times in a Near-Letter-Quality mode.

In ordinary use, a dot-matrix printer can print from 50–400 characters per second (cps), although these speeds may be somewhat misleading. As usually quoted, these are the best possible speeds the printer can reach, not its average output over several lines of ordinary text. Actual output depends on more than printing speed.

Faster printers also print in both directions (bidirectional), have a high-speed tab to jump past blanks on a line (logic-seeking), and sometimes even a high-speed vertical tab (vertical skew) to jump past blank lines. I recently watched a 50 cps printer with all these features outrun a 120 cps printer that lacked them. If speed matters, look at more than a printer's maximum cps.

One other important characteristic of dot-matrix printers is their graphics capability. Since the dots can be placed anywhere on the paper, in any combination, they are perfect for copying intricate high-resolution drawings from your computer screen. A few such printers can even print in full color, allowing you to capture the full beauty of the images on your screen.

However, no printer can do this without the help of a compatible program running in the computer, and graphics are handled in many different ways on the various printers. *Do not assume* a graphics printer will work with a particular graphics program just because both are for Commodore computers. Unless the program explicitly mentions your particular model of printer, they probably won't work together.

Expect to pay anywhere from $250 to $2000 for a dot-matrix printer, although few home users need one that costs over $700. Most are available in versions with narrow 10-inch carriages and wider 15–18-inch carriages. Wider carriages take up more space on the desk and cost more, but they're the only way to print on paper turned sideways, on stencils (be sure they are film-covered) or on the wide paper often used by larger computers.

Daisywheel Printers

On a daisywheel printer, full-formed letters are arranged on thin stalks (which resemble the petals of a flower) around the hub of a plastic or metal wheel. This daisywheel rotates in front of a hammer. When the proper letter is in position, an electromagnet fires the hammer against that letter. Some letter-quality printers do not use daisywheels; instead, they arrange their letters around the sides of a drum or over the surface of a thimble or ball. The latter, popularly known as golf balls, are descended from the famous IBM Selectric office typewriter, still the recognized standard of top-quality printing.

While all of these printers produce what is generally called "letter-quality," the quality of the output varies. It can range from excellent to something that appears done on a child's typewriter.

Daisywheel printers are generally slower and more expensive than dot-matrix printers. They range from 7 cps to about 55 cps, and from $350 to $2000 or more. Add to this $200–$350 for a tractor-feed mechanism (included in the price of most dot-matrix printers). This is a special set of rollers and ribbed treads that allow the printer to use continuous sheets of computer paper with perforated side margins. Unless you will always hand-feed your paper a sheet at a time, you will want this option. Sometimes it comes in two versions—a simpler version with one set of tractors, and a fancier version with dual tractors. The latter

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can wind the paper backwards through the printer, allowing you to print superscripts and subscripts (letters above and below the normal print line).

For the very well-endowed, some daisywheel printers can also be equipped with costly single and dual sheet feeders and envelope feeders that automatically print whole reams of letterhead paper and envelopes. Unless you're into personalized bulk mail, you probably won't need these accessories.

Although many daisywheel printers advertise graphics capability, this is based on using the period as a dot and drawing entire pictures with it, one dot at a time. Although the method works, it is rarely used and not supported by paint (graphics) programs I've tested.

The trend over the past few years has been for dot-matrix printers to improve the appearance of their text and for daisywheel printers to become cheaper. In the past, you could decide which type of printer to buy on the basis of price and print quality, but there are now models of each type in all price ranges. The remaining differences are in speed, graphics and appearance.

The best solution may be to buy one of each type, since a fast dot-matrix printer and a cheap daisywheel together provide both high quality and high speed when needed—and for less money than a high-speed daisywheel printer. If you also need graphics, this is an especially good solution. On the other hand, if your time is worth anything to you, any extra money you spend on a faster printer of either type will be well repaid.

Laser Printers

The most interesting new type of printer is the laser printer, loosely based on the office copier. Instead of photographing pages to be copied, laser printers paint their characters directly on the light-sensitive drum inside the copier. This results in a copy as good and as fast as those of any other copier.

Instead of characters per second, these printers are rated in pages per minute. The slowest one available prints eight pages per minute (about 270 cps). Unfortunately, it also costs from $3500–$10,000, depending on options, making it an unlikely partner in a Commodore home computer system.

Ink Jet Printers

This printer is interesting in theory, but disappointing in practice. It sprays ink onto the paper from a nozzle. There are very few moving parts and almost no noise as the printer operates. These printers have also become fairly inexpensive this year; both of the ones I've seen cost under $500.

On the other hand, the sprayed ink has a tendency to smudge, and it's relatively faint compared to other dot-matrix printers, unless you use special, highly absorbent paper. When adjusted for darkest print, ink jets may also give off an unpleasant odor. Their speeds are also merely average for dot-matrix printers—about 60 cps. However, they do a better job of printing in color than any other printer I've seen, because there is no way for the colors to foul a nonexistent ribbon.

Thermal and Thermal-Transfer Printers

Thermal printers are based on the same principle as the old 3M Thermofax machine, which created an image in heat-sensitive paper. Those thermal printers still on the market are quiet and quick, up to 200 cps. They are also cheap, sometimes under $200. However, their paper is not like ordinary paper and is quite expensive, not widely available and remains sensitive to heat. (I recently had to recopy all my old Thermofax documents, because after ten years they had nearly faded away.)

Thermal-transfer printers are a variation on this technology, using a ribbon made of thermal material but printing on ordinary paper. These machines are new and could be quite an improvement over traditional thermal printers.

Electrostatic Printers

Electrostatic printers are a variation on thermal printers. They use a special paper with a layer of aluminum over a black sheet. When printed, the desired characters are created by burning through the aluminum layer, exposing the black sheet below. The resulting printout is permanent, though subject to creases. The printers themselves are cheap, but the paper is quite expensive, not widely available and must be photocopied if an ordinary-looking printout is desired.

Making Connections

In actual practice, your choice of printer may be dictated by other choices. Only a few of the most popular printers are fully supported by widely sold printer interfaces and application programs. If you already know which word processor, spreadsheet or other application program you want to use, you may be able to choose a printer by simply scanning through program manuals to see what works. If a printer is not listed there, you must assume it will *not* work with that program until the company tells you otherwise. I can't emphasize this enough. Just because two products are both for the Commodore *does not* mean they will work together.

Most word processors, for example, only perform their best tricks with a few specified printers, and the favored printers vary from word processor to word processor. Similarly,

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even favored printers may not work unless connected to the computer via an approved cable or interface.

Serial Bus

Commodore designs its home computers, from the VIC to the Plus/4, to connect with printers through the serial bus. Although they all also support an RS-232 port, via the Commodore 1011A interface on the user port, and can interface a printer via the cartridge port, the great majority of commercial programs expect to find the printer on the serial bus, like Commodore's own printers.

Centronics Parallel

Serial bus printers come in two types—Commodore's own and those connected via parallel interfaces. Surprising though it seems, almost no one has made a serial interface to work on the serial bus (except for the Interpod and Cardco's new parallel plus serial model). Instead, nearly all the companies that make such products translate from the serial bus to a Centronics parallel connector, because the majority of available printers are connected via a Centronics connector.

Commodore's serial bus computers, with the exception of the new C-16, also support RS-232 printers connected via the user port, as though they were modems. Most such printers require Commodore's VIC 1011A RS-232 interface (or an equivalent from another maker) to modify signals at the user port to match the RS-232 standard. Although using an RS-232 device connected this way is theoretically as simple as opening a file to any other printer, many programs neglect to support RS-232 printers connected this way.

User Port Parallel Interfaces

A few companies have also taken advantage of the parallel data signals available at the user port to provide a Centronics parallel interface via the user port. Since using the port this way requires some software changes inside the computer, such interfaces are often incompatible with commercial programs that require the full resources of the computer.

PETSCII and ASCII

Unfortunately, being connected to a printer via one interface or another isn't enough. Commodore long ago decided to make slight changes in the industry-standard ASCII (American Standard Code for Information Interchange) codes for various characters.

Ever since, Commodore computers have needed added translation abilities before they can print on non-Commodore printers. Most interfaces now include the necessary intelligence to do the needed translations, and many now go further, even sending the special codes necessary to make a non-Commodore printer emulate a Commodore printer's special graphics characters and other special features. Some also include pretty-print options, which convert unprintable graphics into descriptive words in printed listings.

Impressive though such feats are, remember that only a few interfaces can do them all, and only when combined with a few of the most popular printers. If Commodore graphics are important to you, either buy a Commodore printer or one of the small list of interfaces that fully support Commodore graphics, along with a printer that fully works with that interface.

Switches and More Switches

Once your computer, interface, printer and applications program are all connected together, odds are they still won't work. A couple of years ago, a dealer told me he had never had a computer/printer/interface combination work correctly right out of the box. That situation has improved since, but not nearly enough.

One very good reason for buying Commodore's own printers is that they need no interface and generally *do* work right out of the box, with the possible exception of the 1526, which has different commands from the other printers in the line.

Those who buy a 1525e or MPS 801 can rest assured that programs they buy for their Commodore computer will nearly always support these printers. If those two printers possessed more speed and better print quality, there would be little need for other printers (and articles like this one). However, Commodore's printers are better known for good prices than beautiful or rapid output, leaving a large market for other firms and endless problems for users and columnists.

The most troublesome aspect of using an *alien* (non-Commodore) printer is getting the switches set properly. Most printers come with a dozen or more tiny switches that need to be set. Each is important, and failure to set them properly can cause the printer to refuse to print at all. Add to these the switches and software commands of the interface and the software commands of the computer, and it's a wonder anything ever works.

The solution to switch problems is your dealer. If you can find a competent dealer, he or she can properly set all the switches on both the printer and interface before you take either home. That simple step can save you hours of anguish. No matter how much more the printer, interface, and applications programs cost when bought from a single knowledgeable dealer, it's worth it to have everything work properly the first time.

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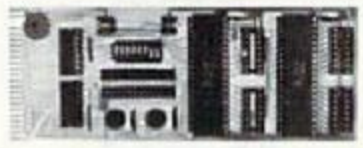

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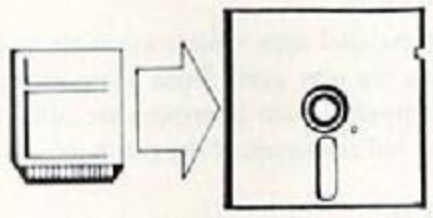

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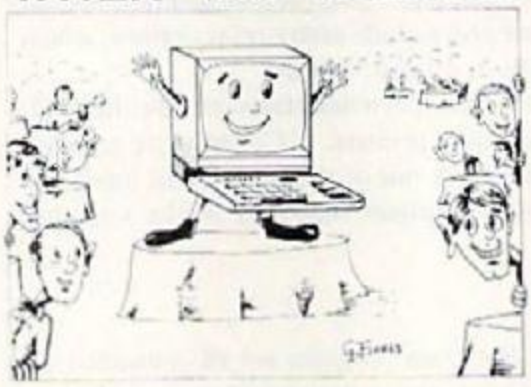

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them on and off together. Unless you have multiple disk drives in an older 64 system, this will work well. If power surges are a problem in your area, a good multiple-outlet filtered switch is offered by Radio Shack. I use three of them and have had only one problem—a switch that had to be replaced after a year.

For those with multiple disks that hang up when switched on together, Radio Shack also offers a more costly sequencing switch that will supply power to each device in the correct order. *($50 from Radio Shack. For all computers.)*

VICSwitch. To use several serial-bus computers with the same printer or printers, you can use the VICSwitch as a networking system. Up to eight devices can be used together. Just be careful not to turn any of them off and on again while the network is on, and watch out for files left open after use. *($150 from Handic Software, 520 Fellowship Road, B 206, Mt. Laurel, NJ 08054; 609-663-0660.)*

Supplies

Many of my printer supplies come from Quill Corporation in Chicago. Here is a review of one of their many products for computer users.

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The previous reviews (with the exception of Hush 80) originally appeared in the Midnight Software Gazette, *a review magazine edited by Jim and Ellen Strasma.*

Address all author correspondence to Jim Strasma, Commodore Clinic, 1238 Richland Ave., Lincoln, IL 62656.

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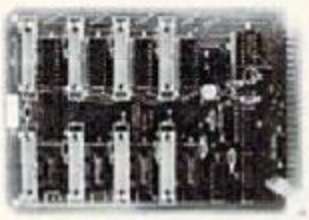

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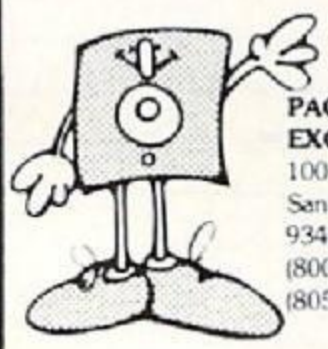

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Print Features

If you have a suitably interfaced computer and applications program, here are some of the features with which a good printer can provide you:

Justification is the process of inserting extra spaces throughout a line to make the printed results align at both the left and right margins. Better printers also support *micro-justification*, in which the extra spaces are spread within each word, not just between them. A few printers and word processors also support *proportional spacing*, a scheme in which the space between letters is kept constant, regardless of whether they are narrow or wide.

Underlining is done either simultaneously with the underlined text or in a second pass over the same line. A few printers, including the Commodore 1525 and 801, can't underline at all without special tricks.

Boldface, *shadow print* and *emphasized print* are all ways of drawing added attention to special text, such as headlines, either by double-striking it or by making the characters wider than usual, or both.

Superscripts and *subscripts* are used in technical writing. They usually involve moving the paper a half line above or below the normal print line and then back.

Italics and *custom characters* allow you to print some of the text with a different appearance, either by using an alternative character set, designing a custom character or character set, or by changing print wheels on a daisywheel printer.

These options are useless in your printer unless they are also supported by the interface and applications program you are using. Fortunately, some programs now permit you to set up custom printer commands to fit your equipment, and others allow you to send special printer commands within ordinary text.

Other Features

If you do many listings, the ability to automatically skip over the perforations at the bottom of a page, rather than print across them, is a very desirable feature. Another good feature is an easily changeable and inexpensive print head, as print heads are subject to clogging and other problems after long use. Being able to replace it quickly and easily yourself is a plus.

In a dot-matrix printer, having tractors behind the platen (the place where the paper goes around a roller to meet the print head) is a mixed blessing. Although it avoids the common problem of wasting a sheet of paper every time a printout is started, the curl imparted by the platen may require you to dispose of that sheet anyway, and rear tractors are not very effective in doing subscripts and superscripts.

The alternatives to tractor feeds are pin feeds and friction feeds. Pin feeds are basically cheap tractors. Instead of a band full of knobs contacting the sheet of paper at several holes at once, a pin feed only contacts the paper at one point. Sometimes the pins are built into the platen itself, which assures better contact with more pins, but also means the pins can't be adjusted for paper of various widths, such as tractor-fed postcards.

Friction feed is the simplest of all; it works like the familiar typewriter, relying on pressure to keep the paper in line. Due to the way most paper ends up with more printing on the left side than the right, most friction-feed mechanisms are unable to keep their paper from skewing badly to the side after a few sheets are printed. Unless you will print only single sheets, friction feed is ineffective.

If you will be printing special papers, such as postcards, multipart forms or stencils, make sure your printer can handle them. Many printers are unable to generate enough force to pull heavy cardboard from the floor up into and through their mechanism. Others lack enough force in the print hammer(s) to print through a multipart form or properly print a stencil. When you shop for a printer, bring samples of what you'll be using, and test them with any prospective printer.

Accessories and Supplies

Print Buffers

Some printer interfaces also do other chores. One of the best includes a 4K print buffer. This special memory area inside the interface receives up to 4096 characters from the computer at high speed, and prints them as fast as the printer can accept them—generally much slower.

If you print many high-resolution graphics drawings, such a buffer can speed up your printouts considerably, by quickly dumping a full line of high-resolution graphics data to the printer the moment the printer can accept it. They are also useful when printing documents up to about two pages long. The buffer allows the computer to go on to the next task, and even use the disk drive, while the printer finishes on its own.

If this ability is important to you, but you need more than a two-page buffer, various companies sell larger buffers, typically 64K and up, for about $300. These buffers plug into either a Centronics parallel connector or an RS-232 serial connector, depending on the model, and may be used with suitably interfaced Commodore computers. The best of them also include logic to avoid being filled up with redundant spaces, thus making more effective use of their storage space, and allowing more memory to be added later as needed.

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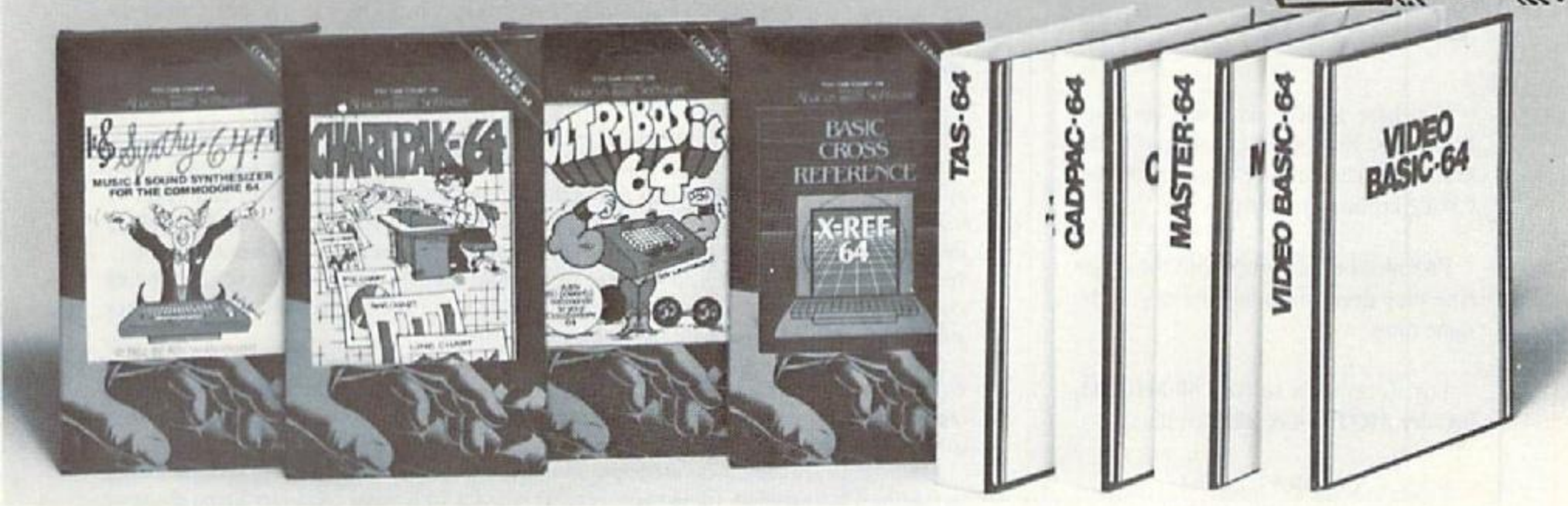

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MASTER 64

This professional application development package adds 100 powerful commands to BASIC including fast ISAM indexed files; simplified yet sophisticated screen and printer management; programmer's aid; BASIC 4.0 commands; 22-digit arithmetic; machine language monitor. Runtime package for royalty-free distribution of your programs. Includes 150pp. manual.

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This superb graphics and sound development package lets you write software for distribution without royalties. Has hires, multicolor, sprite and turtle graphics; audio commands for simple or complex music and sound effects; two sizes of hardcopy to most dot matrix printers; game features such as sprite collision detection, lightpen, game paddle; memory management for multiple graphics screens, screen copy, etc.

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Ribbons

In the old days, printer ribbons came on spools and were quite cheap, about $2 each. More recently, they have come in convenient cartridges that won't smudge your fingers, but cost $14 each when you can find them at all. Even more recently, some ribbons have switched from the traditional ink-soaked nylon, which works until it gradually fades away, to carbon-film ribbons, which give an outstanding appearance while they last, but have very limited lives and can't be reinked. One new printer of this type is said to be good for only eight pages of full-color printing before needing a new ribbon.

In considering the cost of a printer, be sure to include the cost of its ribbons. There's a lot to be said for a printer that still uses $2 ribbon spools, as long as you don't mind the mess of changing them. Short of this, you can reink some cartridge ribbons by using a special tool and ink offered by other companies.

Paper

Computer paper comes in various widths, thicknesses and colors. It also comes in single sheets, rolls and fan-folded continuous sheets. The most common variety used with Commodore computers is fan-fold paper, in either 16- or 20-pound weights, with each sheet 11 inches long by 9½ inches wide. Each sheet is bordered by a half-inch row of holes along the sides that can be torn off after printing. The holes serve as guides for a tractor- or pin-feed mechanism, and they help keep the paper from slipping during a printout. Depending on the printer, the paper may feed from behind or below the printer, and your work area will need to include room for a fair-sized box of paper.

Most computer paper comes in boxes of individual fan-folded sheets loosely held together by partial perforations along all four edges. Micro-perf paper, which is becoming increasingly popular, simply makes more and smaller perforations along each edge, making it easier to tear and leaving a neater margin when you do tear the perfs.

Although larger computers use paper with green bars across each sheet to serve as guides in reading a listing, plain white paper is more popular with home computer users, many of whom never make program listings. As for quantity, paper can be purchased in boxes as small as 200 sheets. However, it is far more economical in larger quantities. A full box is 2500–3500 sheets. That seems like a huge supply, but if you use your printer regularly, it may not last a month. By banding together with friends, you may be able to order at a discount. [R]

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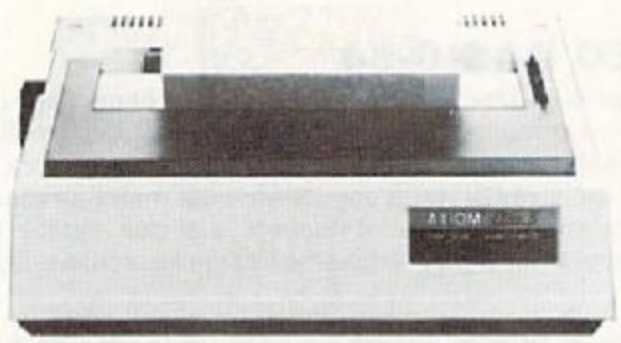

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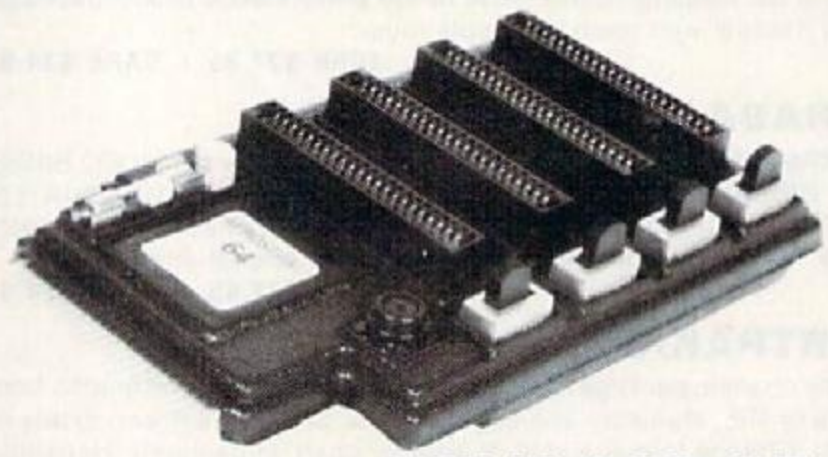

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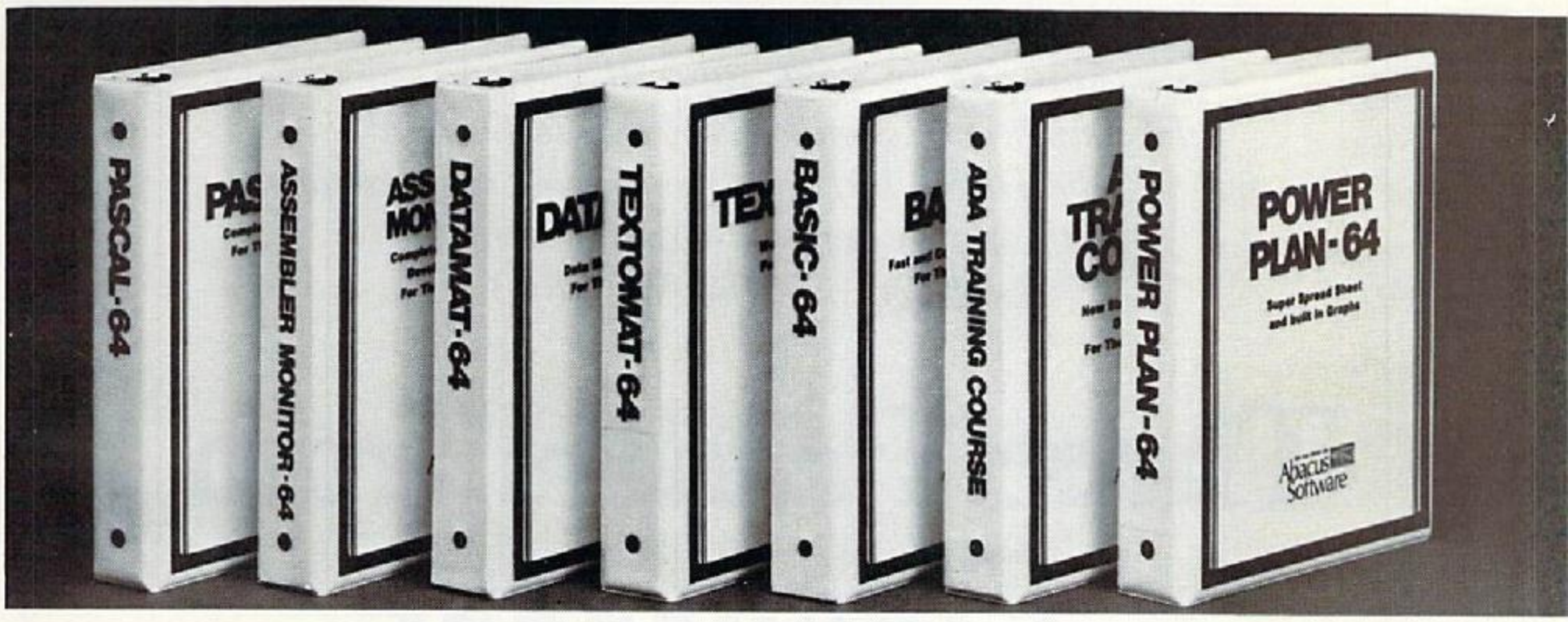

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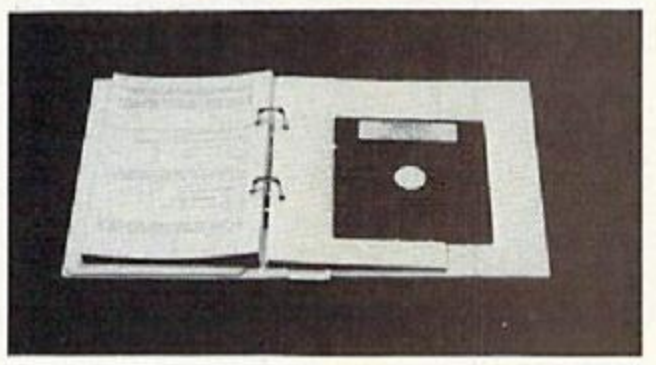

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This article starts off with a review of Commodore's new daisywheel letter-quality printer, the DPS-1101, and continues with reviews of their two new dot-matrix printers, the 1526 and the MPS-803.

Three Printers from Commodore

By TOM BENFORD

A daisywheel letter-quality printer uses a spoked wheel with characters molded onto the ends of the spokes for printing, so that it looks somewhat like a technologically advanced daisy. The singular advantage of any daisywheel printer is the absolutely pristine quality of the print output. The letters are sharp, clear and perfectly formed images that rival or exceed the output of the finest professional office typewriter.

Don't confuse the terms letter-quality and correspondence-quality. High-resolution dot-matrix printers will produce correspondence quality; only a daisywheel printer will produce true letter-quality, since the letters are fully formed and not composed of a series of dots.

It's really no secret that Commodore has had a letter-quality daisywheel printer in the works for some time. I got my first look at a prototype of it last January at the Winter CES in Las Vegas. As with so many of their other products under development, however, they teased me with a peak but refused to elaborate on the details.

By the time you read this, your dealer will probably have the DPS-1101 on his shelves. When I received mine, my first impression of the DPS-1101 was "nice." After using it for a couple of weeks, I've changed my opinion, though. Now I'd have to say "very nice."

Inside and Out

It's an attractively styled unit, molded in dark charcoal-gray plastic that matches the new Commodore Plus/4 and C-16 computers. It's rather large in comparison to other printers, but that's because it features a 13-inch platen. The extra-wide platen makes the DPS-1101 useful for spreadsheet applications or other uses where wide printer paper is desirable. Of course, you can also use the standard 8½-inch-wide paper as well. The standard paper-advance mechanism is friction-feed, but an optional tractor-feed accessory is planned as of this writing.

One of the biggest complaints I've heard about Commodore printers in the past pertained to the oddball ribbons utilized in these units. Apparently, Commodore had received a lot of complaints about the availability of ribbons for their printers, and they finally did something about it; the DPS-1101 uses a standard IBM Selectric-type ribbon cartridge that can be purchased just about anywhere. Since it's a car-

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tridge, changing or replacing the ribbon is literally a snap—you push the ribbon release lever, pop out the old cartridge, drop the new one in and snap it closed.

I was also quite relieved to find that the daisywheel is also a standard item. The DPS-1101 uses a Juki or Triumph-Adler print wheel that can be found at most better stationery or office supply stores. Changing the print wheel is also a simple affair, thanks to good engineering of the print assembly.

The controls are well-positioned on the printer, affording easy access to the user. On the right-hand top panel of the 1101 are the print spacing controls, and a choice of 10-, 12- and 15-characters per inch (proportional spacing is also available). Also found on this panel are the controls for form-feeds, pause/clear and power indicators. On the back are the power switch, power-cord socket and two serial jacks. On the inside of the 1101 are two banks of DIP switches that allow custom-tailoring of the printer's functions, such as linefeed on or off. I'll go into more detail about these DIP switches a little later on.

The DPS-1101 is assigned as device #4 at the factory, but by manipulating the settings of the DIP switches, the device-number assignment may be changed. This is a handy feature, since it's plausible that you may wish to have both the 1101 and a dot-matrix printer connected at the same time. By keeping the dot-matrix printer assigned as device #4 and changing the assignment of the 1101 to #5 or #6, you can direct the output to either printer! The dual serial jacks on the back of the 1101 make it possible to daisy-chain two printers together, as in this example.

You'll also be pleased to know that you won't need an interface to use this printer—you need only a simple serial cable from either the computer or the disk drive to the printer. While this is fine for us Commodore users, it does restrict the printer to Commodore use only. The inclusion of either an RS-232 or a Centronics jack would have expanded the appeal and marketability of this printer.

One feature that definitely should have been included—a paper-advance switch—was not, and I don't know why. You can manually advance the paper—two large knobs at either end of the platen roller do the job nicely—but a switch would have made it easier.

If you're looking for a really *fast* printer, the DPS-1101 is not for you. Because of the actual print mechanics of daisywheel printers, none of them will ever win an award for speed. The DPS-1101 cranks out beautiful output at a very respectable rate of 18 characters per second (cps). That might seem like a snail's pace to anyone who's used to the 60 cps or faster output of a dot-matrix printer. Judging it against other letter-quality printers, 18 cps is rather brisk; most daisywheel printers move at 12 to 16 cps!

Noise is an inherent problem with daisywheel printers (the printer hammer must strike the daisywheel hard enough to smash the imprint of the letter onto the paper), and the DPS-1101 is no exception; while it's not the loudest printer I've ever heard, it's not the quietest, either. I found that placing the printer on a rubber typewriter mat (available from an office supply

1526 Dot-Matrix Printer

The 1526 printer had made its debut about a year ago, but the unit was so beset with problems that Commodore recalled it. After the recall, Commodore ripped the unit apart and corrected all of its many bugs, and now it's back on the market again.

One of the most serious faults of the early version of the 1526 was that it would crash right in the middle of. . .anything—word processing, program listings—it didn't discriminate. Needless to say, this made it quite unpopular with users, and dealers were up to their necks with returns of the unit.

I admit that I, too, was skeptical of this past-proven bad apple, and when I got my hands on one of the "new, improved" 1526s, I resolved to *really* put it through the paces. The bottom line is that it not only passed, but did so with flying colors!

The 1526 has an impressive list of features, among which are: tractor-*and* friction-feed, bidirectional printing, programmable line spacing, cartridge-load ribbon and a 10-inch carriage width. The unit is fast, spewing forth characters in excess of 60 per second, and since it prints in both directions, it can crank out 45 80-character lines in slightly less than one minute!

The printed image is the result of an 8 × 8 dot matrix, which affords hi-res characters with true descenders. Of course, the entire graphics character set is printable, and it plugs directly into your computer or disk drive without any interfacing.

Standard goodies that come with the 1526 are a smoked-plastic dust cover (which also serves to reduce the already low noise level), a serial cable and a wire paper holder that snaps onto the back of the printer. Also included are a power cable, a well-written user's manual and a ribbon cartridge.

It's good to see that Commodore has corrected the bugs that originally plagued this printer, and I could find no fault with the unit in its present form. If you're looking for a moderately priced ($225–$300) high-resolution dot-matrix printer, the 1526 should fill the bill nicely for you.

The MPS-803 Dot-Matrix Printer

If you're computing on a budget, the MPS-803 dot-matrix printer may be worth investigating, since it's an economy-priced unit that will most likely sell for under $200.

The MPS-803 prints at a rate of 60 characters per second bidirectionally, features friction-feed, and is a compact and lightweight unit. There are some trade-offs, however, to keep the price down. First, the friction-feed is nice if you want to print out a letter, but for extended program listings, form-feed paper is the way to go. I tried using continuous-form paper on the unit, and without the sprockets to pull the paper through, I had some problems with long listings.

Another drawback is the low-resolution (7 × 5) dot-matrix image; while it produces decent printout, the lack of true descenders detracts somewhat from the legibility. Descenders are the "tails" of certain characters, for example, p, q, j, g and y. We're all used to seeing these tails dip below the rest of the characters on a line, but with the MPS-803, they're slightly elevated; it takes a bit of getting used to.

The unit I used for testing performed flawlessly. It plugs directly into your computer or disk drive without the aid of an extra interface. There are even device # and lines-per-inch selector switches (in the back of the machine) and a Self-Test mode to make sure everything's working correctly.

The unit is molded in black plastic, which makes it color coordinated with the new Commodore computers—the Plus/4 and C-16. Its compact size enables you to tuck it away in an average-sized briefcase for ease of transportation.

The 803 is ideally suited to the uses of a novice computerist or anyone who needs inexpensive, reliable printout without frills.

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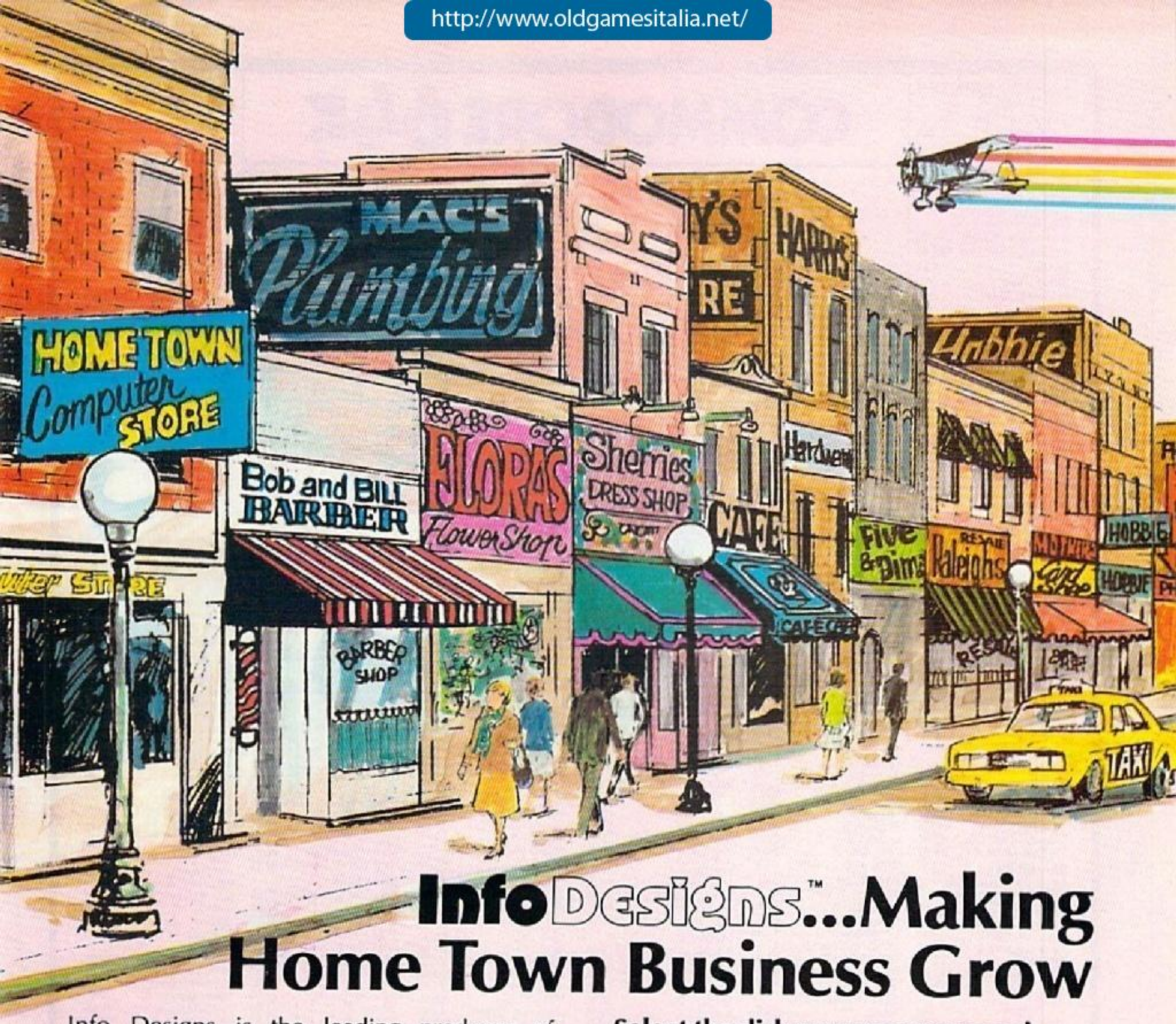

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store) significantly reduces the noise level.

What It Prints

You should remember that you won't be able to print out *graphics* characters with the DPS-1101; since the printing depends on the characters contained on the daisywheel itself, you're limited to printing out *only* those characters. If your primary use of a line printer is listing the contents of your programs replete with graphics characters, you'll need a dot-matrix printer. Optional print wheels are available for printing out foreign languages, but I don't know of any graphics wheels available.

Some of the 1101's more impressive print features are the ability to underscore, backspace during printing (to add an accent mark over a character), shadow-print and multi-strike a character for emphasis. Additionally, printing subscripts and superscripts is also possible.

The internal DIP switches control a number of functions, depending on how they are set. The options that are controllable via these switches include auto linefeed on/off, CBM or standard ASCII coding, paper length, line spacing, international character sets and device # assignment. The 1101's accompanying owner's manual provides complete information on configuring these switches.

The 1101 also has a built-in RAM buffer that can store and hold up to 2K. What this means, simply, is that you don't have to wait for the printer to catch up to the computer; the extra information is held in the buffer until the printer gets to it, thereby freeing up the computer for another use while printing continues. Once again, this isn't a major feature, but it *is* nice to have.

And now, the bottom line: What's its cost? At the time of this writing, the price is *tentatively* set for $399.95, with some of the larger stores discounting it to some degree. My sources tell me that you'll probably be able to buy a DPS-1101 at discount department stores and toy chains for about $300.

No matter how good or how reasonable the 1101 is, not everyone needs or wants a letter-quality printer. For those of you who fall into that group, Commodore has also released two nice dot-matrix models (see sidebars). R

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This is actual text created on a C64 with Copy-Writer and printed on an EPSON printer. The double column print mode was used.

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DISK TIPS
FOR BEGINNERS

BY KARL T. THURBER, JR.

This article provides you with some practical tips to help you better manage your disks.

This article will concentrate on the disks themselves rather than technical topics relating to the disk drive. I'll present a potpourri of hints and tips regarding disk handling, cataloging, file naming and so on that you can use for more logical, efficient and effective disk management.

Disk Handling

1. Disk IDs. Give your disks meaningful ID characters (the two-digit identifier placed in the upper right-hand corner of the disk directory). Doing this will help you in cataloging, indexing, storing and retrieving your disks.

For example, you might assign GA to your first game disk, UA to your first utility disk and so on. Start with your first disk and keep up with the system you develop as your collection grows. (Table 1 shows a suggested disk cataloging scheme for general home use. The point is: Start with an expandable cataloging system of your choice and stick with it!)

To avoid confusing your disk drive with more than one of the same ID names, make sure each ID you assign is unique. To better ensure uniqueness, assign characters such as +, #, – and % as one of the ID characters—in fact, assign any character that the 64 keyboard will let you type in and that the 1541 drive will accept!

Also, note that although there are utility programs available that allow you to change the disk ID after you have programs on the disk, these programs should be used carefully and should never be applied to any protected commercial disks, which could be ruined.

2. Sending your disks by mail. If you exchange disks with others or send disks to authors of magazine articles for their programs, it's a nice courtesy to first format your disk. Doing this will save the author some time and allow you to set up the disk name and ID as you want it. Enclose your disk in a regular disk mailer, send it first class and mark it with such cautions as "Do Not Bend" and "Magnetic Media—Do Not X-Ray." Be sure to affix sufficient postage: 37 cents is the minimum for a single disk.

3. Use of write protectors. I always use these tape strips, having found that they provide very inexpensive insurance against write accidents that could instantly wipe out an irreplaceable program or even an entire disk.

Keep a protector covering the hole on the side of your disks whenever you're not actually writing to them, and especially when you loan out your disks to others. Without the protector installed, one mix-up of source and destination disks when copying programs could mean curtains for your cherished programs!

4. Directory printouts. If you have a printer, it's a good idea to make a directory printout of each disk you own. You may punch holes in these directories and keep them on 8½- × 11-inch sheets of paper in a looseleaf binder or cut up and place them loose in the disk's envelope or taped to its outer surface. If you use soft plastic disk-holder pages, you may dispense with the envelope and insert the directory in the small transparent pocket to the left of the disk pocket.

To print out the directory, use the following sequence in Direct mode:

```
LOAD"$",8:OPEN4,4:CMD4:LIST
```

When printing is complete, clear the printer by typing:

```
PRINT#4:CLOSE4
```

5. Disk organization. For the most part, program collections tend to "just grow," with neither rhyme nor reason. Try to keep only one type of program on a disk; if you don't separate different types of programs, they will ultimately be very difficult to sort out!

Once a disk is nearly full, you may want to go back and rename program titles that are unclear, scratch or erase old versions of programs, group sim-

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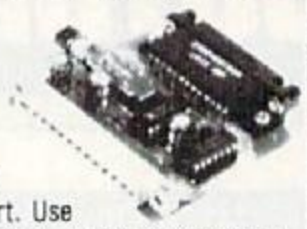

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Games (arcade/action)	GA
Games (fantasy/adventure)	FA
Games (strategy/simulation)	SA
Educational	EA
Business (home management, finance)	BA
Programming—Languages	LA
Programming—Tutorial	TA
Utilities	UA
Demo	DA
Music	MA
Miscellaneous	XA

Table 1. *This suggested disk-cataloging scheme can be modified as desired to suit your particular needs.*

ilar or related programs together and so on. On disks where there are many different programs or groups of programs, you can help organize things by placing dummy directory entries on the disk at key points to serve as handy dividers.

You could accomplish this by giving a filename (such as "– – – Board Games – – –") to a nonexistent program, then saving it. That will fool the disk drive into treating the empty program as a real one.

Simpler dividers can be used to merely show where one group of programs ends and another group begins; these might consist of only dashes (for example "– – – – – – – –"). Note that, as with any other filename, you can use no more than 16 characters, and no two filenames can be identical.

6. Filename tips. You can use unusual (but easily remembered) characters such as ! or % for the complete filename of frequently used programs, such as wedges and loaders. For example, I have renamed the familiar C-64 wedge as ! in my collection, and this saves me some typing each time I use the wedge.

Another way to speed up entry is to assign numbers as the first character of filenames for frequently used programs. For example, if you want to speed up loading of the C-64 wedge but don't want to rename it with an exclamation point (!), then rename it as 1 C-64 WEDGE.

You can then load the wedge by simply typing in 1* rather than the full filename, making use of the * for pattern matching. Reserve the digits 0–9 for this technique. To avoid possibly loading in the wrong program from your disk, be careful not to assign a number as the first digit of any other program.

Bonus tip: Note that, as with tape loading, you can type a shifted run/stop to automatically load and run the selected program. To use this feature, simply type in LOAD "PROGNAME", 8: taking care to add the colon. Now, instead of hitting the return key, press the shift and run/stop keys together. This will load and automatically execute your program.

7. Menu generators and other disk utilities. Put a menu program on the disks that you create, to facilitate accessing programs from the disk. This can be a real time-saver and can minimize confusion in booting up complicated sets of programs.

For example, some menu-generator programs ignore sequential files (which you don't load in the usual sense, anyway), and others ignore filenames that are indented with a space as the starting character (thus ignoring subprograms loaded from the disk's main programs). Still other menus ignore the first program on the disk, thereby ignoring the menu itself if it is at the top of the directory.

The "C64.Menu" program on the Commodore Disk Bonus Pack, for example, is an excellent menu generator that alphabetizes the directory and ignores indented filenames and sequential files; it creates a very short sequential directory file, which it reads each time the program is run. If you indent this menu's filename, saving it on your disk as " Menu," it will ignore itself in building the disk's menu. If you make it the very first program on the disk, you can boot up the disk by simply typing: LOAD "*",8.

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Other useful menu programs appear from time to time in the various Commodore-oriented magazines, as well as in catalogs from the Toronto PET User's Group and Public Domain, Inc.

Bonus tip: If you want to add a menu to a disk that's nearly full, you'll have to move the first program to another spot on the disk. To do this, you must first use the Copy command, as described in the *1541 User's Manual* (p. 16 in my book), to give the program a different, temporary name, such as "Temp" or "XX," when moving it down the directory.

Following this, scratch (erase) the original file to make room for your menu at the top of the directory.

Next, reassign the temporary file with its original name.

Finally, save the Menu program; it should appear as the first listing on the directory. Figure 1 shows a sample disk directory that contains a menu generator as the first program on the disk and makes use of program dividers as previously discussed.

Many C-64 users also find it useful to include various other utilities as one of the first programs on each disk they create. Inclusion of the C-64 wedge/DOS 5.1 or other disk-management programs can be a conve-

```
0      "DEMO - DISK TIPS" DA 2A
5    "MENU"                    PRG
1    "- - - UTILITIES - - - -" PRG
1    "C-64 WEDGE"              PRG
4    " DOS 5.1"                PRG
4    "DISK ADDR CHANGE"        PRG
1    "- - - GAMES - - - - - - - - -" PRG
1    "SPACEDUEL BOOT"          PRG
5    " SPACEDUEL"              PRG
1    "SPIKE BOOT"              PRG
18   " SPIKE"                  PRG
1    "- - - BUSINESS - - - - -" PRG
10   "FINANCIAL CALCS"         PRG
12   "INVESTMENT.ALT"          PRG
1    "- - - M/L BOOT - - - - -" PRG
3    "MACH LANG BOOT"          PRG
1    "- - - - - - NOTE - - - - - -"PRG
1    "- - SEE TEXT FOR - -"    PRG
1    "- - LAST PROGRAM - -"    PRG
1    "- - - - - ABOVE - - - - - -" PRG
592 BLOCKS FREE.

READY.
```

Figure 1. *This sample disk directory depicts a well-organized disk, which is accessed by a simple public domain menu, or directory boot. Machine language programs are indented to show that they are loaded via other programs. The last program on the disk, "MACH LANG BOOT," may be used to load machine language games and utilities, as described in Listing 1.*

Listing 1. *A simple method of loading machine language (M/L) programs that must not be relocated in memory.*

```
10 REM ****{2 SPACEs}MACHINE LANGUAGE BOOT
   *****
20 REM -- USE THIS BOOT AS AN EXAMPLE TO{10
    SPACEs}LOAD M/L GAMES AND UTILITIES
30 REM -- INSERT PROG. NAME IN LINE 120{11
   SPACEs}AND STARTING SYS IN LINE 160
40 REM -- SAVE BOOT AS "PROGNAME BOOT"
50 REM -- CALL M/L PROGRAM " PROGNAME",{11
   SPACEs}INDENTING NAME ONE SPACE
60 REM
70 REM ************************************
80 POKE53280,0:POKE53281,0
90 PRINT"{SHFT CLR}{CTRL 2}{11 CRSR DNs}{13
    SPACEs}PLEASE WAIT..."
100 REM -- INSERT M/L PROGRAM NAME IN{14 SP
    ACEs}LINE 120 INDENTING ONE SPACE
110 PRINT"{HOME}{2 CRSR DNs}":PRINT"LOAD ";
    CHR$(34);
120 PRINT " PROGNAME";
130 PRINTCHR$(34);CHR$(44);"8";CHR$(44);"1"
140 REM -- INSERT M/L PROGRAM STARTING{13 S
    PACEs}SYS IN LINE 160
150 PRINT"{4 CRSR DNs}SYS ";
160 PRINT "99999"
170 PRINT"{HOME}"
180 POKE198,2:POKE631,13:POKE632,13
```

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nient time-saver and avoids unnecessary disk-flipping when doing file maintenance on the disk.

Note also in Figure 1 that you can insert explanatory notes or reminders in the directory, in the last four filenames. Also, if you use a menu program such as Commodore's "C64-.Menu," which alphabetizes the menu screen (in ASCII-code order), and you also use file dividers, these file dividers will be out of place on the menu screen since they will be alphabetized to appear ahead of the filenames, which start with letters.

8. Changing drive address. If you own two disk drives and typically use the second drive for data files, place the Disk Address Change utility (contained on the demo/test disk included with your 1541 disk drive) on each of your data disks. Turn on the computer and the drive that's to have its device number changed (usually to #9), insert the data disk, load in the Disk Address Change program and change the device number to 9. Turn on the other drive (#8), insert the program disk, load it into the computer, and you're ready to go without having to switch any disks.

Of course, you can eliminate this by permanently changing the device number of your second drive, but it's not within the realm of this article to explain how to do this.

9. Testing disks before use. It's a good idea to test each box of disks you purchase as soon as you buy them to spot any bad disks early on. Formatting new disks as soon as you receive them will help in securing warranty replacement adjustments, help you to have ready-to-use disks available at all times and will help prevent the disappointment of discovering a bad disk when it's the last one you have on hand. To avoid doing twice as much work, develop a disk- and ID-naming file plan, and format these disks using this system.

10. Drives: Transport with care! Whenever transporting your disk drive, treat it gingerly, ensuring that it is not subjected to extremes of heat or cold. Maintaining proper alignment on the 1541 is a classic problem, and isn't helped by unnecessary jarring and vibration. Newer 1541s come with a cardboard Head Vibration Protector, which looks like a square cardboard disk. You should insert this protector into the drive whenever it is in transit.

Alternatively, you can probably achieve the same protection by inserting a discarded disk or cleaning disk jacket into the drive when moving it about.

11. Disk file maintenance. I've already mentioned that understanding and using the files contained on your disks will be less confusing if you logically structure the placement and naming of programs on each disk, grouping related files and programs together.

Also keep in mind, however, that if you have repeatedly scratched and resaved programs, it's a good idea to periodically send the Validate command to the disk, so that the block-allocate map (BAM) updates. This allows your drive to tidy up and reorganize the disk and its directory. This will let you know how many free blocks remain on the disk, so you'll get the most from the available disk space.

Bonus tip: Performing a Validate command on a disk containing random files may damage the files, so it's best not to do this on this type of file. Never try to use the Validate command on a commercial, copy-protected disk, and never attempt to place other programs on the same disk. If you do either of the above, you may wreck the disk and be unable to access the programs on it.

12. Keep track of your disks. As your disk collection grows, keeping track of what's where becomes of paramount importance.

Several methods of disk tracking can be used. You may simply print out each disk's directory on a letter-size sheet of paper, filing the sheets in a looseleaf notebook set up with dividers to indicate the types of programs involved.

Another method is to use a database or filing program to catalog your disks by category or type, disk name, ID and program title, or various combinations of these. Using such a program affords all of the advantages that a computerized database brings to any complex operation, and can even let you generate stick-on labels for your disks. However, entering data requires a good deal of typing, which can be tiresome to maintain on a regular basis.

Another approach is to make use of an automated disk cataloging system. The one I use regularly is Disk Master, a modified PET program that appeared in *RUN*'s February 1984 issue under the title "Disk Master Revisited," by Bob Baker. This program allows you to automatically read in

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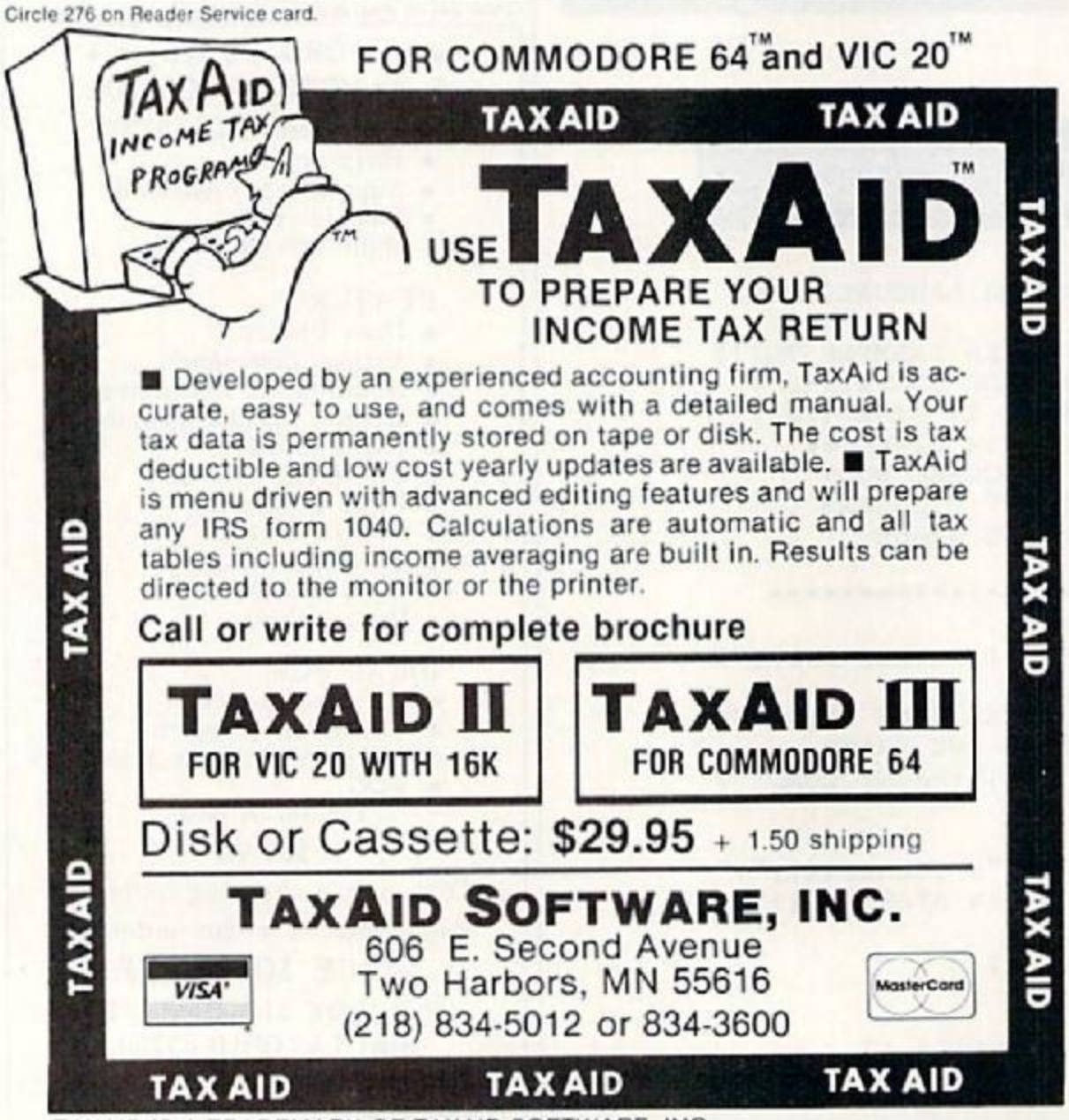
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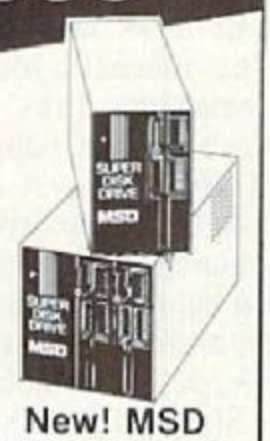

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each disk's name, ID, program titles and other data, and it also constructs a customized database of your disk collection.

This program allows you to search your collection by various categories, show which IDs and disk names are in use and generate alphabetized directory printouts from the program, among other things. I know several individuals who even make up homemade disk envelopes and print the Disk Master directories right on the envelopes!

13. Take care of your disks. To preserve your disks, don't eat, drink or smoke around them; don't write on them with pencil or a ballpoint pen (use a felt-tip instead); don't leave your disks near a telephone, TV or other magnetic source; don't touch or scratch the disks' magnetic surfaces; don't subject your disks to extremes of temperature; and don't remove disks from your drive until it has stopped spinning (a few seconds *after* the 1541's red light goes out). Also, minimize the exposure of your disks to foreign particles, dust and static electricity.

Store your disks vertically in their envelopes, preferably in a disk caddy, and don't paper-clip anything to them. Especially important: If you let others use your disks, make sure they know how to use and properly take care of them.

14. B is for backup. Despite your best intentions, disk disasters *do* occur. Thus, it's best to back up your most valuable and/or irreplaceable software or data. While copying disks is no fun, judicious backing up can save untold grief. The 1541 Backup program, included with the Commodore Bonus Pack, is a slow but reliable copier, and many other single- and dual-drive copiers are available through magazine listings and commercial software packages.

Many manufacturers will sell you backups for a fraction of the original software package price if you are an original owner of the disk. Some of the newer programs are exceptionally fast: For example, Blue Sky's Supercopy can back up an entire disk in seven to eight minutes.

15. Machine language programs. Most of us are aware that to load a machine language (ML) program from disk requires the LOAD "PROGNAME",8,1 format. This is done so that the machine language program loads itself into the same memory locations from which it came.

This loading procedure is easy to forget, and it's even easier to forget the required SYS call needed to run the program once it's loaded. One approach is to include the SYS location right in the program's title; this becomes both a reminder that the program is in machine language and of what the starting SYS command is.

For example, you might call your ML program "PROGNAME 32768." This reminds you that the game is loaded by typing in LOAD "PROGNAME 32768",8,1, followed by typing in SYS 32768 once the program is loaded from disk. (Note that you don't have to type RUN to get this type of program running.)

Bonus tip: Even this procedure can be improved upon. Construct a simple boot, or loader, program for your machine language programs, such as games and utilities. These boots can be written so that once they are loaded, they automatically take control and load the machine language program.

A simple boot for many such programs can be modeled after the short program shown in Listing 1. Note that, in this example, "PROGNAME BOOT" is the name of the boot program, and " PROGNAME" (with its indented space) is the name of the main machine language program. Both programs are on the disk directory, but as explained in our discussion of menu generators, the indented machine language program may not show up on the menu, depending on the particular menu program you're using. The boot automatically performs the SYS command needed to make the program run, so there's nothing special for you to remember or forget!

16. Label it right! Instead of merely scrawling some information across the disk label, make the label count. I show the disk name and ID across the top of every label and show how the disk is accesssed: whether by loading a menu, loading individual program names or whatever else is required. I usually indicate a disk's key programs right on the label, and also indicate if any of them are machine language and without boots. You might want to use color-coded labels for different program categories (games, utilities, business and so on).

Figure 2 is an example of what a good label might look like. Use it to show the disk's name, its ID and how it is accessed, such as via a menu program. List the disk's key programs

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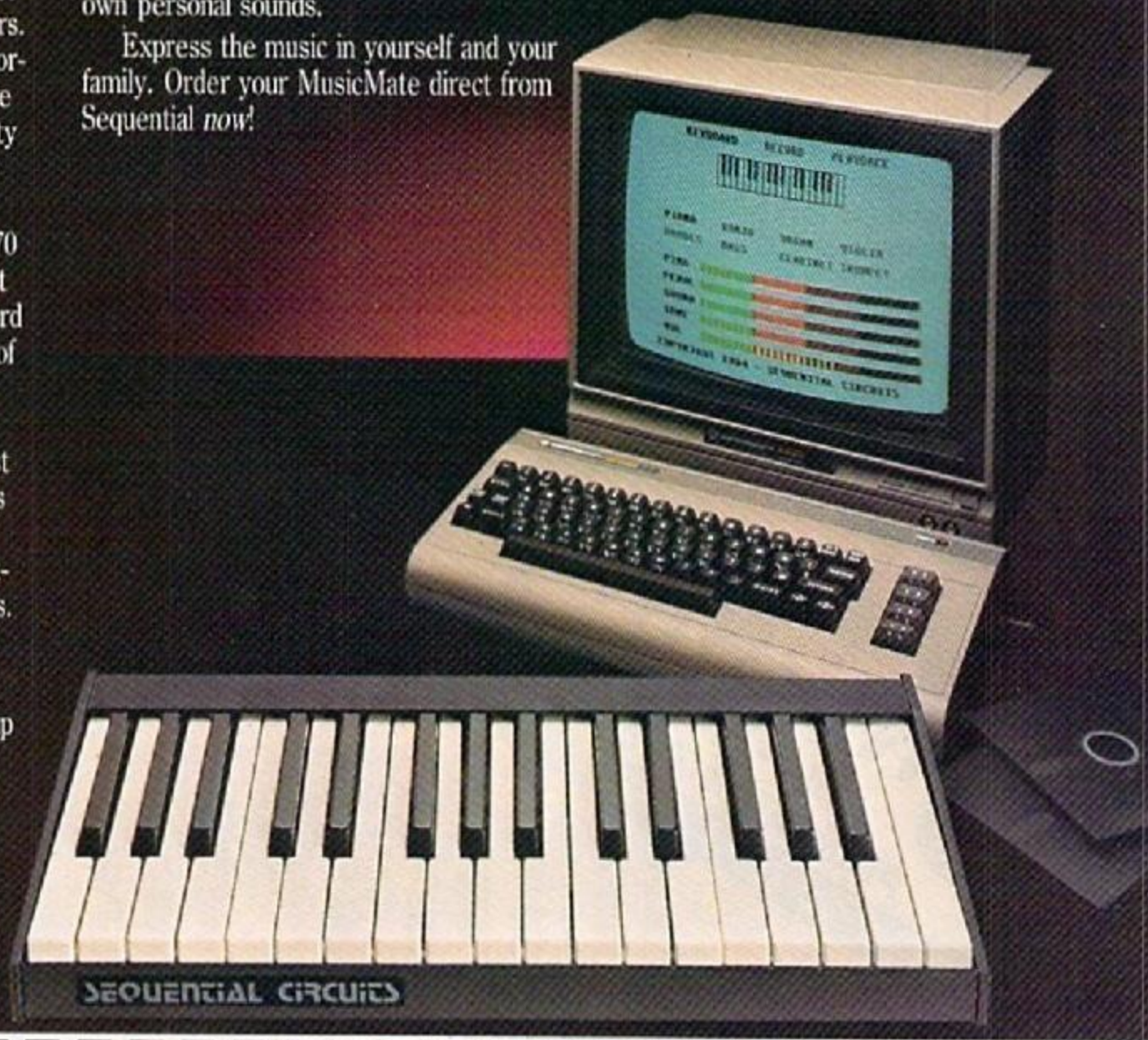

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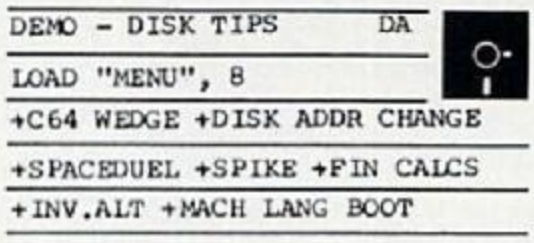

Figure 2. *An example of a disk's label, which is a key to a disk's contents.*

and any special instructions (such as necessary starting SYS commands) to get programs up and running.

17. Using those "other" disks. Commodore 1541 disk drives use SSSD (single-sided, single-density) disks. But, you can also use single-sided, double-density disks with no problem, as these may be considered to be high-quality single-sided disks.

Commodore drives use so-called soft-sectored disks, but you can use hard-sectored disks as well, since the 1541 drive doesn't care about the extra holes in the latter type of disk. On the other hand, the 1541 is designed for single-sided disks, so it's best not to get into the risky business of trying to make a double-sided disk out of a single-sided one by manually cutting out a second write-enable notch—easy to do, but done at some risk to the disk, the programs you may write to it and possibly even to the disk drive itself.

18. Take care of your drive! Early 1541s are temperamental, particularly with respect to head alignment and overheating, so it's best not to jar the drive unnecessarily or to keep it running for hours on end with poor ventilation. Using a small fan to direct a steady flow of cool air on the drive minimizes the chance for overheating.

Occasionally use a vacuum cleaner to clean out the front of your disk drive and clean the read/write head. The drive should not require frequent cleaning, as the back-and-forth movement of the drive's read/write head against the disk's surface produces a self-cleaning action that minimizes oxide and dirt build-up. Heavy drive use, however, may require occasional cleaning of the head with some isopropyl alcohol applied with a cotton swab.

Alternatively, one of the many head-cleaning disks currently on the market can be used to do the same thing. Some of these cleaning disks are very abrasive, however, so you should clean only when necessary rather than on a rigid time schedule, to prevent needless head wear.

Bonus tip: Frequent read/write errors can be a tip-off to upcoming drive alignment problems, particularly in the last few blocks of the disk, when the outer- and innermost tracks (1 and 35, respectively) are in use. Nevertheless, the bulk of such disk errors are caused by dirt on the read/write head, a worn head-load pad, power-line spikes and noise and disk defects. These should all be investigated before seeking head realignment. R

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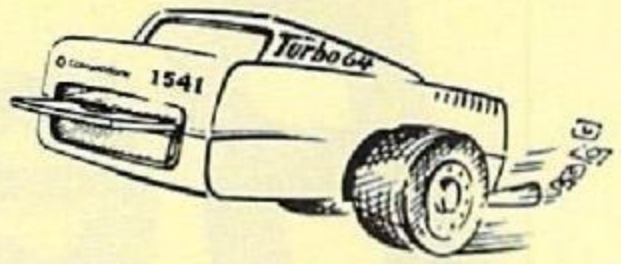

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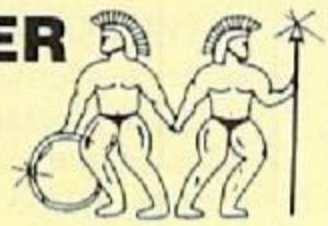

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LET THERE BE Light Pens

By SHARON ZARDETTO AKER

Short of an actual touch-sensitive screen, a light pen is one of the most direct of input devices. With a graphics tablet, you touch here and something happens there. A mouse rolls on a desk as the cursor moves on the screen. A joystick limits you to a few possible directions, and, of course, the keyboard doesn't lend itself to very much other than typing.

Each of these devices has its place in the world of computing; indeed, I have at least one of each, and I wouldn't trade one for another for certain applications. However, I have just spent a few months investigating light pens and their attendant software, and I am glad to be adding them to my arsenal of input devices.

How a Light Pen Works

The inside surface of your monitor or TV screen is coated with a phosphor that glows when hit by a beam of electrons. An electron beam scans a narrow line across the width of the screen from top to bottom; the entire screen scan is called a frame. Because the phosphor fades so quickly, the screen must be "refreshed" (scanned again from top to bottom) very often; it is, in fact, refreshed at the rate of 60 frames per second.

When you point a light pen at the screen, the electron beam hits the phosphor within the pen's field. The pen registers the "hit," sending a signal to the computer. (The light pen is plugged into the joystick port.) The computer, in turn, makes note of the point on the screen that was being scanned when it received the pen's signal. The result is that the computer "knows" just where you placed the light pen.

Of course, depending upon the brightness of the screen and the sensitivity of the pen, you do not actually have to touch the pen to the screen for a "hit" to register; this can lead to many problems as you move toward the desired spot on the screen while the computer tracks your progress. As a result, light pens are made so you can activate them only when you want the touch to register.

The way a pen is activated depends upon its design. You might have to press a key on the keyboard, press a button on the pen itself, or push a pressure-sensitive pen tip against the screen. (Coincidentally, these three types are represented by the three light pens reviewed in this article.)

The method of light pen activation, however, is not the major consideration when you are shopping for a light pen. Hardware is only as good as the software that is available for it, and, of course, there are price considerations as well.

The three light pens covered in this review, from Futurehouse, Inkwell Systems and Tech Sketch, Inc., differ not only in their activation processes, but also in the quality and quantity of software support. Their prices vary, and each seems aimed at a different type of user.

Light Pen Graphics Programs

Since each of the light pens reviewed in this article comes with a graphics program, it is appropriate to discuss the contents of a good graphics package. A light pen graphics program, or any good drawing program, will have menus that give you the following options:

Draw. Draw free-form lines of various colors and widths.

Color Palette. Choose the color you are going to use for any given option; sometimes patterns that combine colors are available in addition to solid colors.

Brush Palette. Choose the size and shape of the "brush" you are drawing with. In addition to different brush widths, a change of brush angle should be available, as well as fancy options such as double and triple dots that let you draw multiple lines.

Shapes. Draw rectangles by indicating the opposing corners, or circles by specifying the center and edge. Shapes can be drawn hollow or filled automatically.

Fill. This fills in an enclosed area with the color of your choice.

Lines and Rays. Draw lines by indicating the start and end points; a connected line option will automatically start another line where the previous one ends. Rays can be drawn by indicating a common starting point and the various end points for each of the individual rays.

Zoom. This lets you magnify a portion of your drawing so you can work on it in detail.

Copy and Move. Move lets you shift parts of your drawing around the screen; *Copy* leaves the original portion intact.

Mirror. This option lets you draw in one section of the screen, giving you mirror images of your drawing in the other quadrants, which results in symmetrical designs.

Undo. Every program lets you erase your entire picture, but some will also let you "undo" only your last command. This is important for correcting mistakes.

Text. This option lets you type keyboard characters onto the drawing field.

Print. A screen dump is a nice extra in a graphics program; however, some might not support your particular printer.

Keep in mind that although a light pen will work with a TV, graphics programs are much better when you use a monitor, due to the sharper image that a monitor gives.

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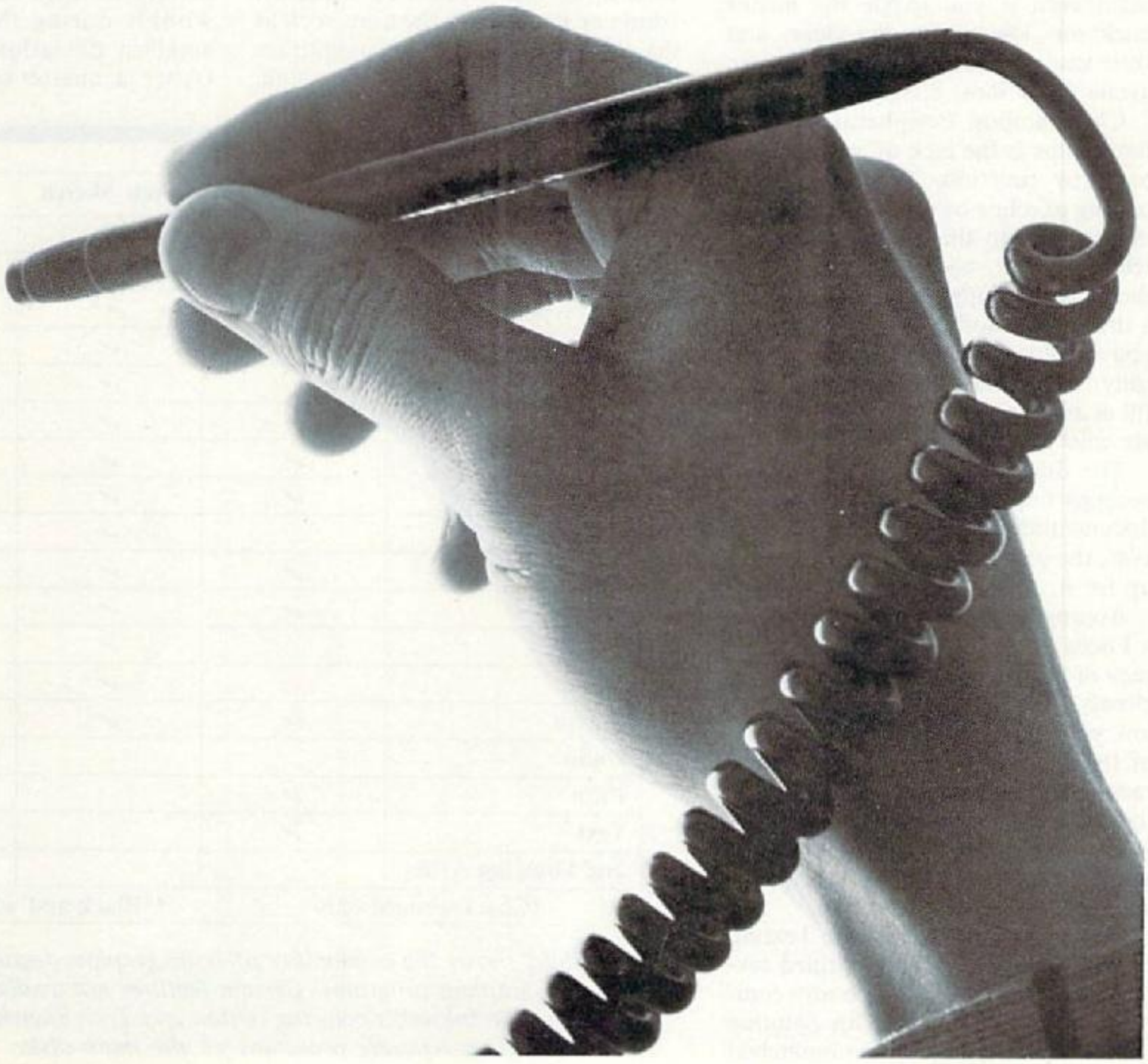

EDUMATE LIGHT PEN by Futurehouse, Photograph ED JUDICE

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Edumate Light Pen

The Edumate light pen, from Futurehouse, is roughly as slim as a standard pencil. It is plugged into the computer with a coiled cord that stretches easily when you reach for the screen. It is activated by pressing a key on the keyboard; to make a potentially awkward system a little more convenient, there is one key on each side of the keyboard (Commodore key and right shift key) that can be used. Despite a few minor flaws, the graphics program that comes with the Edumate pen, cleverly titled Peripheral Vision, is my favorite of the three drawing programs.

Peripheral Vision

The Peripheral Vision drawing screen has a color palette across the top, and a command menu across the bottom; there is also a second command menu, easily accessed from the first. Both the menus and the color palette can be removed from the screen with the f3 key, thereby expanding your drawing area. Anything you draw in the menu areas will remain even if you toggle the menus back on. The menus are clear, and their icons (pictures that represent the available options) are well designed.

Chief among Peripheral Vision's limitations is the lack of a true Move or Copy function. You can take a tracing of a line or object and copy or move that, but this is an entirely different feature, and it cannot replace the ability to copy an entire section of a drawing. Another drawback is that you cannot create shapes automatically. Also, the Fill option will only fill in an area that is enclosed by a single color.

The documentation is brief, and perhaps not entirely adequate. If the documentation is less than ideal, however, the program's ease of use makes up for it.

Among Peripheral Vision's extras is a Focus option that affects the accuracy of the pen, determining just how closely the line being drawn will follow your pen's path. At one extreme of the five available levels, the accuracy is high, but the speed is slow; at the other end, you can get the program to keep up with your fastest strokes, but your lines will get pretty wiggly.

By far the best extra is the Texture choice. There are 35 pre-defined textures that you can use with any combination of two colors. This painting in multicolored patterns is unmatched by either of the other two light pen graphics programs reviewed here, and it is a lot of fun to work with. To make a good thing even better, you can also design your own textures and store your personal texture palettes on a disk for future use. The Peripheral Vision Print option supports most popular printers.

Playground Software

The rest of the available programs for the Edumate light pen are children's programs (in Futurehouse's Playground line of software). Some are terrific, some mediocre, and one is rather poor. Many can be used with a joystick, and all can be used with a KoalaPad (from Koala Technologies) instead of the light pen. A very special feature in many of the programs is the incorporation of S.A.M. (Software Automatic Mouth) from Tronix, which synthesizes speech. The accent is reminiscent of the Swedish Chef on *The Muppet Show*, but it is generally understandable.

The unevenness of the quality of these programs is surprising; even something that should be standard from one program to the next, such as the particular keys that are used to activate the light pen, is not the same. Many of the introductory menus are done in color combinations that are nearly impossible to read. Some require choices to be made with the light pen; some require keyboard input.

Here are brief reviews of the programs available in the Playground line:

Little Red Riding Hood. The first, and currently the only, in a series of Bedtime Stories, this program is narrated by Freddy the Frog. His sprite helper, Fly Guy, is used as a target for the light pen. As the story progresses, pointing to Fly Guy will cause some action on the screen. The child is often spoken to directly, and the total effect is very charming. There is also a short letter-recognition game available on this disk, but it did not hold the interest of my preschooler—it was just too dull compared to the interactive story available.

Alphabet Construction Set. Robo the Builder is the narrator for this program, and he's the only cute thing about it. The child is supposed to trace a letter with Robo's help, then draw one unassisted. The program is utterly unforgiving of the slightest wobble during the tracing, or the smallest deviation in the drawing. (After a quarter-century of printing

	Edumate	Tech Sketch	Flexidraw
Draw	✓	✓	✓
Color Palette	✓	✓	
Textures	✓	✓*	✓**
Brush Widths	✓	✓	
Brush Shapes		✓	
Fill	✓	✓	✓
Lines	✓	✓	✓
Connected Lines	✓	✓	
Rays		✓	✓
Shapes	✓	✓	✓
Zoom	✓	✓	✓
Copy		✓	✓
Move		✓	✓
Mirror	✓	✓	
Undo			
Print	✓		✓
Text	✓		✓
2nd Drawing Area			✓

*Checkerboard only **Black and white only

This chart shows the availability of basic graphics features in the three light pen graphics programs. Certain features not available in the main program, like Inkwell's coloring option and Tech Sketch's print option, are available as separate programs on the main disk.

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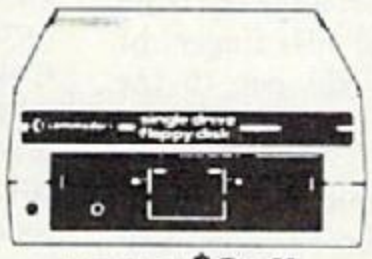

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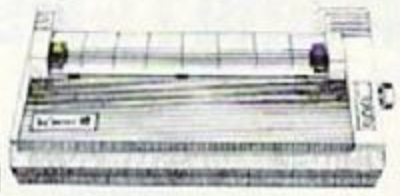

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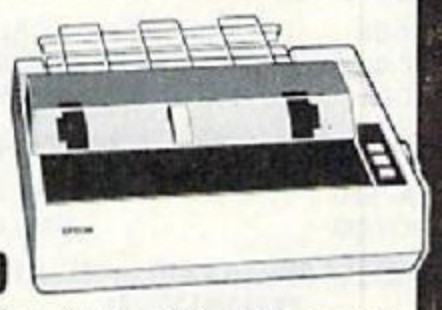

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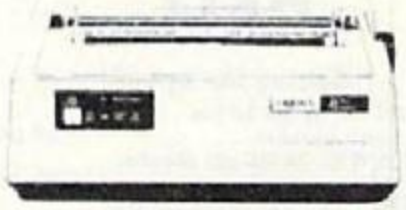

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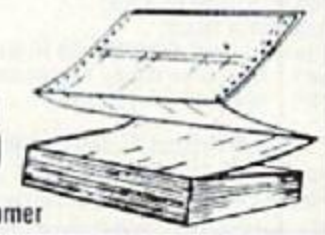

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perfectly recognizable Ns, I was told by Robo that mine weren't good enough and that I had to do it over again.)

The educational value of this program is doubtful. It purports to teach letter drawing, but the muscle control and coordination of wrist and fingers for printing on paper is a far cry from the stretched arm and stiff fingers of someone holding a light pen to the screen.

Computer Crayons. I thought this program to be only mediocre, due to its crude drawings and so-called animation, but my chief tester (my four-year-old) likes it a lot. The child picks a letter, and a picture related to that letter appears in rough outline; it can then be colored in by choosing different colored "crayons." At any point, the picture can be animated; this is sometimes cute (one example being a sketch of a person walking through the doorway of a house), but most often it is a disappointment (such as a lampshade changing color).

Animal Crackers. This one is a winner. Freddy the Frog is back, in charge of a ticket booth. The child buys a ticket to any of seven games, using the ticket to travel to any of nine locations to play the game. The games are pre-reading and pre-math skill builders, such as matching letters, numbers and shapes; the location selection (outer space, farm or playground) determines the background scenery for the game.

Summary

I can recommend the Edumate light pen without reservation; the Peripheral Vision graphics program that is available for the pen is excellent, and the pen itself has stood up to a lot of use in my house over a period of eight months (including a stint at a local nursery school). The Playground Software line holds promise; all of the programs in the series could use a little polishing (except Alphabet Construction Set, which may be unsalvageable), but most of them are enjoyable in their present form. *(Futurehouse, Inc., 310 West Franklin, PO Box 3470, Chapel Hill, NC 27514. Edumate light pen with Peripheral Vision, $34.95; Playground Software, $34.95 each.)*

Tech Sketch

The Tech Sketch light pen is activated by pressing a white button on its shaft. The cord that connects it to the computer is straight rather than coiled (not as comfortable or convenient as a coiled wire). The graphics program that comes with the pen is called Micro Illustrator.

Micro Illustrator

Micro Illustrator's command menu is on a screen by itself, separate from the drawing area; getting back and forth is a simple matter of pressing the space bar. Icons represent each of the possible commands, and there is a full brush palette, as well as a color palette. The color palette gives a choice of solid or shaded colors. (The shades are simply the base color overlaid with a white checkerboard.)

All of the basic graphics options are available, with the addition of a Point option that lets you draw dotted lines. There is also a special Align option, used for aligning the light pen on the screen; choosing Align also brings you to the "inertia level" selection. This is supposed to change the speed at which the cursor follows your pen. I did not find an appreciable difference between the lowest and highest inertia levels, except that the cursor is very bouncy when inertia is set at low.

The documentation for Micro Illustrator is adequate, though brief. There is a rather cryptic piece of advice about "optimum performance" of your monitor: "Normal viewing of a TV or monitor is approximately 30–35 footcandles. This should be considered when viewing and working with computer terminals in general." The last time I had to consider footcandles was in my high school physics class, and I'd be hard-pressed to glean any useful advice from that statement.

There is a Sketchprinter program included on the Micro Illustrator disk. It apparently supports only the Commodore 1525 printer, and its documentation is a few short sentences that leave you in the dark as to a number of things. Neither the instructions nor the program, for instance, let you know when to switch from the program to the data disk. The first question presented by the program is: "Is the picture small or large?" There is no mention of this in the documentation, and you will be at a loss to figure out which to choose. If you have the right printer and can figure out how to use the program, you can print out your Micro Illustrations.

Lite Sprite

Lite Sprite is a sprite-design and animation program that utilizes the Tech Sketch light pen. If you can get past a few program problems (e.g., faulty loads, poor error handling) and the

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documentation, you might enjoy the program very much.

The booklet that accompanies Lite Sprite is a poor excuse for documentation. First of all, its pages are put together in the wrong order: pages 18 and 19 follow page 3; then come 6 through 17, followed by 4, and so on. After sorting out the pages, typos, small errors and generally poor presentation, you might think the program is useless. However, it is the documentation, not the program, that is useless.

With Lite Sprite, you can design a sprite with the pen on a 24×21 grid. Each sprite can be put into one of 128 available frames. The options available for manipulating sprites are terrific. You can take a sprite and flip it horizontally or vertically, shift it by one or any number of pixels in any direction or invert it. It is easy to view animation sequences of your frames; you can specify which frames will be shown and the delay that should occur between them.

The main Lite Sprite screen is composed of a Main Menu, a Command Window, a Work Station and a five-frame Preview Window. However, with this setup, you must keep track of a Work buffer and a Frame buffer, and transfers from one place to another cannot always be made directly.

The procedure for choosing from the menu needs better error trapping. If you choose the wrong item by mistake, you will still have to answer questions pertaining to that choice in the Command Window—there is no way to cancel a selection. This is very annoying, because it is easy to move the pen slightly while pointing at the menu, resulting in the wrong choice. This "no-turning-back" is also a problem in many other parts of the program.

Despite the annoying programming flaws and the poor documentation, Lite Sprite is certainly fun and potentially useful. You can transfer the sprite data into a Basic program. (Transferring all 128 frames, however, will leave only 6K of programming space.)

Lite Sprite only supports the design of single-color sprites; the documentation does suggest (in one of its more lucid moments) that you design high-resolution multicolor sprites by utilizing the sprite priority scheme and layering differently colored sprites.

There is also a Programmer's Guide

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disk, which includes four programs that demonstrate the use of the light pen in a Basic program.

Each of the light pens reviewed here is programmable from Basic, by the way, although some of the manuals offer better guidelines than others. Most light-pen programs in Basic will restrict you to pointing the pen at menu choices; a drawing program will run much too slowly in Basic to be of any value.

Summary

The Tech Sketch light pen is a reasonable value for the money; the graphics program included with it is useful, and the sprite-generating program, though flawed, has its merits. At this time, there are no other software programs available for this light pen. *(Tech Sketch, Inc., 26 Just Road, Fairfield, NJ 07006. Light pen with Micro Illustrator, $49.95; Lite Sprite, $49.95.)*

Flexidraw Light Pen/ Software System

The Flexidraw light pen, from Inkwell Systems, is, by looks, feel and price, the most technologically advanced of the three pens reviewed here. It is comfortably chunky—nearly twice as thick as the other pens. It is activated by pressing the collapsing tip against the screen. The pen comes with a diskful of applications; the main one is, not surprisingly, a graphics program.

Flexidraw Graphics Program

The Flexidraw graphics program embodies some very advanced features, and, at the same time, it excludes some very basic ones. It is the hardest to learn, and it may be more practical than fun.

The Flexidraw drawing screen is most of the monitor screen, less the border and a menu strip along the right. The menu is made up of words—a strange sight in these usually icon-based programs. As you choose certain options, others appear or disappear; this is sometimes helpful, but it's often confusing.

You can't miss Flexidraw's most obvious shortcoming: no color. Although you can color in your pictures through the use of another program (supplied on the disk), the main program is strictly black-and-white. Also, there are no options for brush size and shape.

Flexidraw does, however, have many unusual and useful options. The Grid option keeps your lines and shapes confined within specified beginning and ending points; you can also choose two sizes of grids. There is an Average function that helps you draw smooth, free-form shapes, by getting rid of "jiggles." A Cross option can be selected to put cross hairs on the screen for good alignments. The Move option lets you place a copy of a section of your picture in different spots and in different ways—it can be used to cover, blend or reverse parts of what it is placed over.

The setup of the program, and all of the documentation, is aimed at the programming buff. Even the simplest of commands are given programming-oriented names. There are, for instance, Get and Put options, which are analogous to the usual Copy and Move. While Get and Put are certainly familiar to anyone who has used Microsoft Basic graphics, they are not the right vocabulary for a user-oriented application. Even the various Put options are called ABS, OR and XOR—comfortable enough terms for a programmer, but why not use Cover, Blend and Reverse?

The Fill option, since this program is black-and-white, only fills in black, although you can invert the screen at

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any time to reverse the black/white fields. There are patterns available, but they can only be placed over black areas. So, to get a pattern, you must first fill with black, then fill again with the pattern. This is very clumsy, and it is almost an insult on top of the injury of no color.

I found the program a little confusing; certain options are available only from certain modes. If, for instance, I want to fill something with a pattern, I have to remember to be in the Point (as opposed to the Draw) mode, and enable the Grid option as well. Until both of those conditions are met, Fill doesn't even appear on the menu. I am sure that, if I were to spend more time with the program, I would become more familiar with its modes and options, but, as it stands, I don't particularly want to spend more time with it.

I also found that the keyboard was utilized entirely too much for a light-pen program; such things as selecting spots for line and shape options are indicated by pointing *and* pressing a key.

Pen Palette

A separate program on the disk allows you to color your Flexidraw drawings. It is doubly awkward: First, it is separate from the main program; second, it is set up rather oddly.

After loading a Flexidraw drawing, you are starting with a black-and-white picture, all of which can be viewed as either background or foreground. Pen Palette lets you define 23 different "paint pots," which are combinations of two colors. When you select a paint pot and paint a section of your drawing, the two colors are applied to the background and foreground of the section being

Other Light Pens Available for Your Commodore

Koala Light Pen System

Koala Technologies Corp., 3100 Patrick Henry Drive, Santa Clara, CA 95050. (C-64, with Graphics 64 software on disk, $99.95.)

McPen

Madison Computer, 1825 Monroe St., Madison, WI 53711. (C-64/VIC-20, with software on disk or cassette, $49.95.)

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Cartridge for the 64.
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We could go on and describe the MAE but we thought you would like to read our customers' comments. The following are actual unedited comments from correspondence about the MAE:
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painted. While you can change an already painted area just by redefining the paint pot you used for it, it is severely limiting after working with the much freer programs of the other light pens, or a program such as KoalaPad's KPaint.

Other Programs

There are a number of small applications on the Flexidraw disk that you might find useful. A sprite editor lets you design sprites on the screen, giving you the data necessary to Poke into your Basic program to achieve that design; a Sprite Animator will let you try some "color animation."

The Flexiplot program gives a few machine code routines that you can call from your Basic program for high-resolution graphics plotting, and Transgraph lets you send your drawings over a modem.

There are also some demonstration programs that show how you can incorporate light-pen routines into your Basic programs.

Summary

The Flexidraw package is good, but only for the right audience—the computer hobbyist or the experienced programmer—not the casual user, nor children. The documentation, and the programs, assume a programming bent on the part of the user. Things are explained, but usually in jargon: "The software continually averages the pen screen location so that any noise caused by the system. . . ." You may wonder what sound has to do with anything.

There is an interesting group of programs on the disk; while they may be, in some ways, technically superior to the other programs reviewed here, the overall impression, chiefly influenced by the lack of color in the drawing program, is that the disparity between program quality and price is too great.

The pen itself is the best of the three; the pressure-sensitive tip is certainly the most convenient of activation devices—whether that is worth the difference in the price is something you will have to decide for yourself. *(Inkwell Systems, 7770 Vickers St., PO Box 85152 MB290, San Diego, CA 92138. Flexidraw Light Pen/Software System, $149.95.)*

Address all author correspondence to Sharon Zardetto Aker, 20 Courtland Drive, Sussex, NJ 07461.

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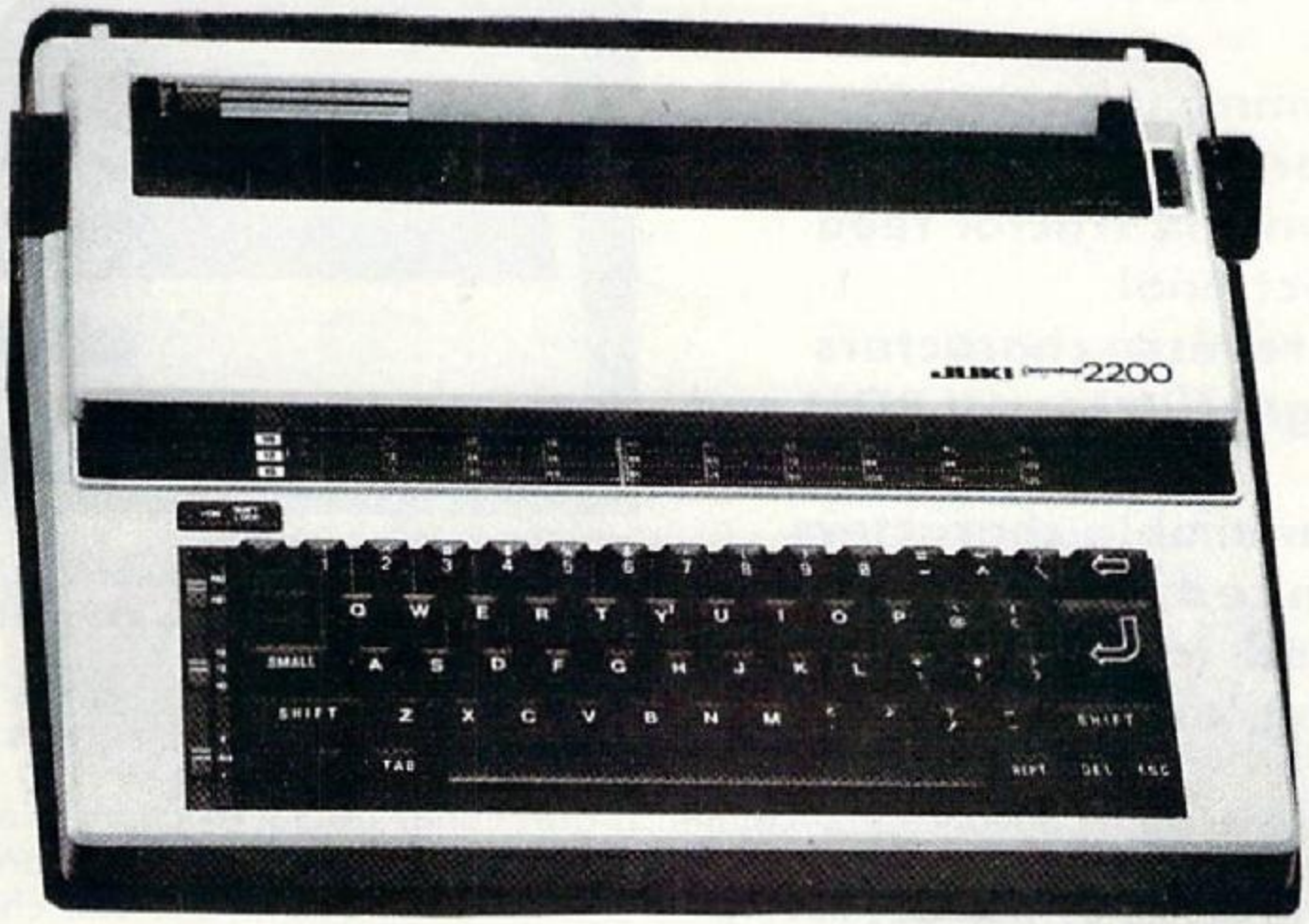

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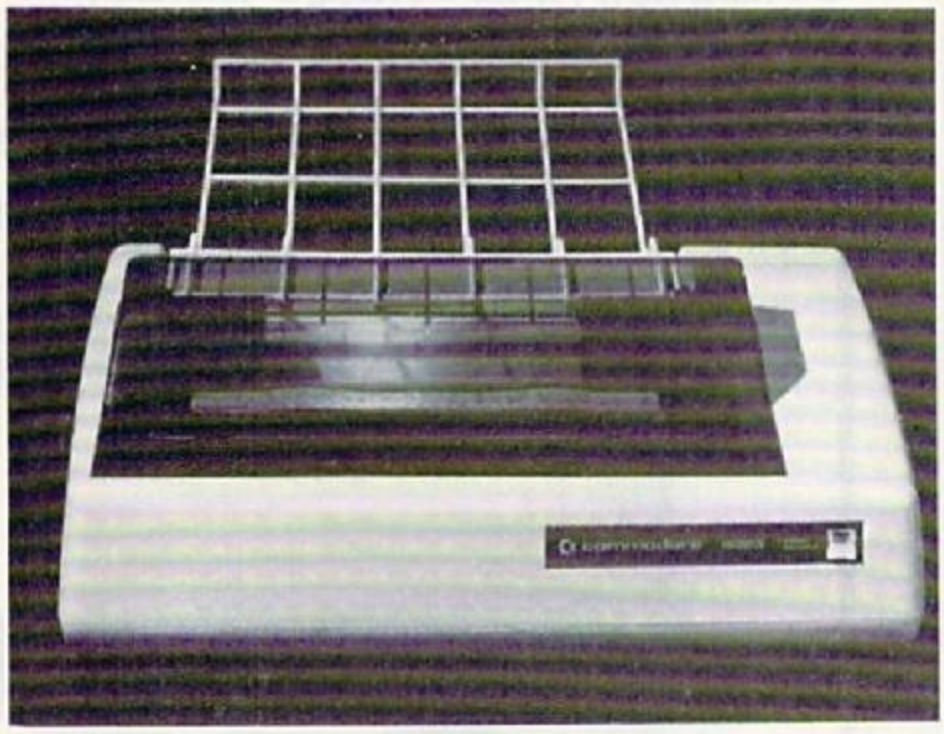

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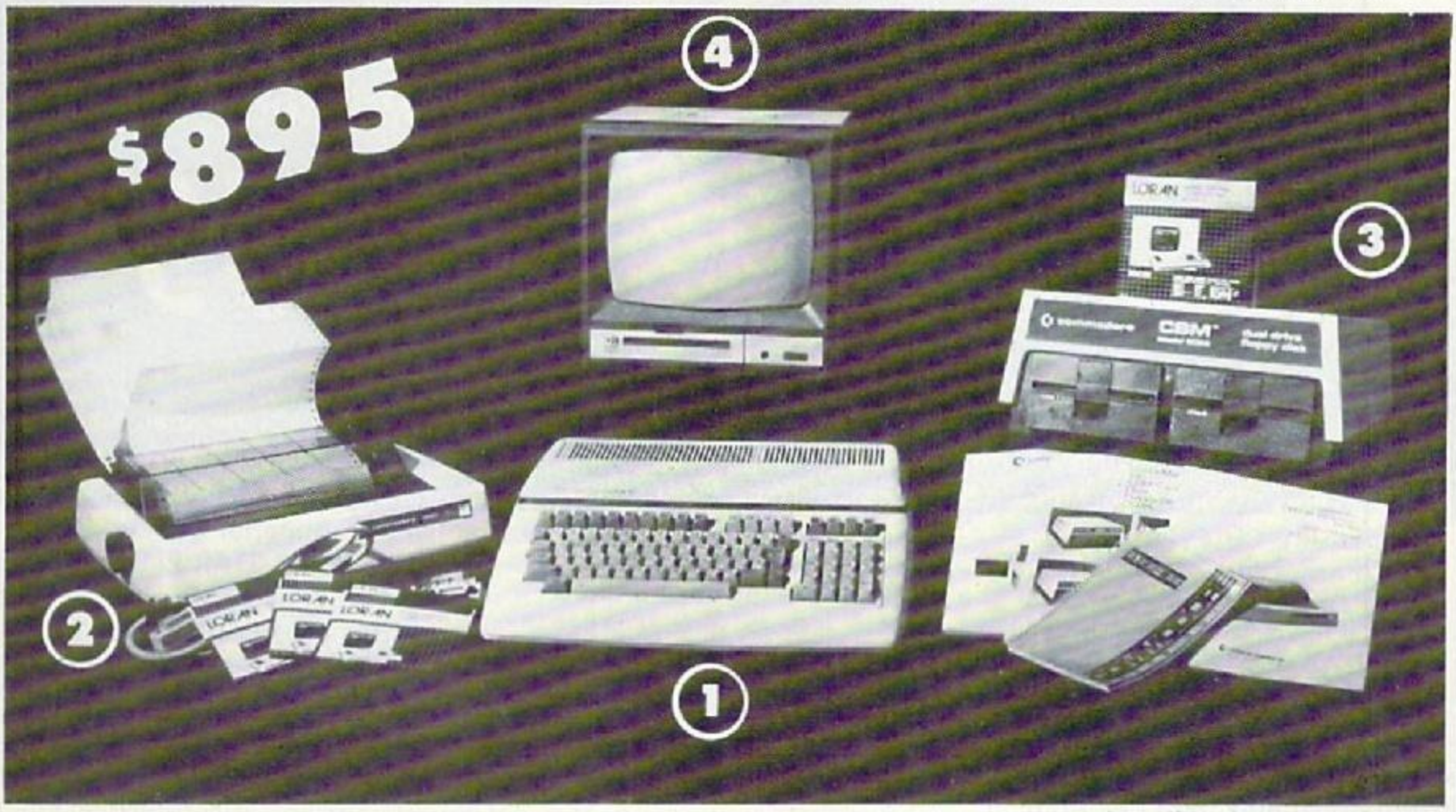

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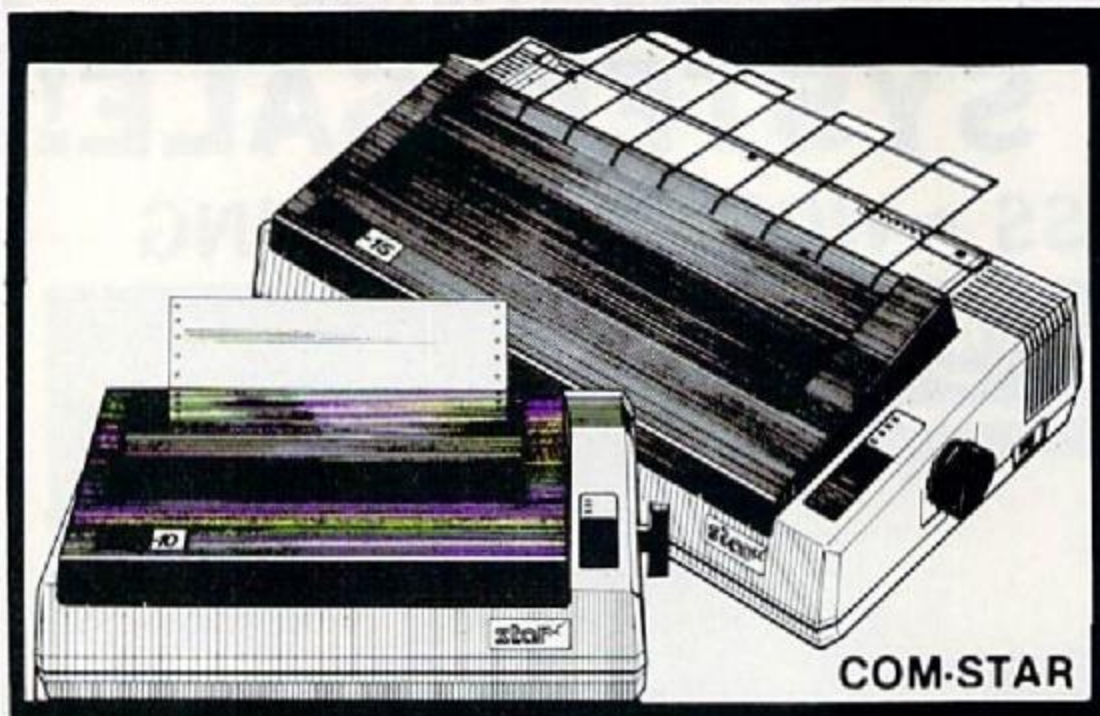

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From p. 12.

NCR at very high prices. A C-64 goes for close to $500 U.S., a 1541 for close to $400, if you can find one. I couldn't even get a delivery date from the people I spoke with about a disk drive. Consequently, most people down here use the Datassette.

Ralph S. Lees, Jr.
St. Maarten
Netherlands Antilles

$16F Jumpman jiminy—Jumpman is one of the C-64's best commercial games, with great sound and challenging multi-level screens. Unfortunately, a lot of us never get to see the higher level screens because we always run out of jumpmen. Here's a way to avoid running out.

Load the game boot and run it. Exactly 90 seconds after hitting the return key, simultaneously press the run/stop and restore keys, which will reset your machine. Your screen will be blue, and the cursor will be flashing. Now enter:

```
POKE 24015,173 : POKE 54296,15 : SYS 9*4096
```

If all is well, the Options screen should come on. Proceed normally, playing the game as usual but with one exciting difference: You'll never run out of jumpmen! When one of your men is killed, a new one appears, while the number you have left remains at seven.

Tim Tan
Winnipeg, Manitoba
Canada

$170 Terminating games—Many computer games end with the player's man, android or spaceship being blasted or otherwise put to death. Unlike the real-world variety, this death is generally reversible, often by pressing a key. Vigorous pursuers of realism will appreciate the routine below, which is a *real* android killer. Executing the appropriate version blacks out the screen, disables all keys and sounds, and thoroughly corrupts any Basic program in memory. There is *no* way to recover. The first routine is for the C-64, the second is for the VIC-20.

```
6400 REM ** KILLER FOR C-64 **
6410 POKE808,225:POKE53280,0:POKE53265,11:POKE649,0
6420 FORX = 54272TO54296:POKEX,0:NEXT
6430 FORX = 2048TOPEEK(61) + 256*PEEK(62)
  STEP7:POKEX,PEEK(56324) :NEXT:WAITX,0

20000 REM ** KILLER FOR VIC-20 **
20010 PRINTCHR$(147):POKE808,127:POKE36879,8:POKE649,0
20020 FORX = 36874TO36878:POKEX,0:NEXT
20030 FORX = 4096TOPEEK(61) + 256*PEEK(62)STEP7:
  POKEX,PEEK(162):NEXT:WAITX,0
```

Louis F. Sander
Pittsburgh, PA

$171 Program password—I recently devised a security lock system for my programs. Now, persons not knowing the secret code are prevented from using my programs. The code is any number; where the program below says "code," just plug in a number. The program should be inserted before the main program.

```
1 POKE 800,100 : POKE 819,245
2 INPUT"{SHFT CLR}ACCESS CODE";A
3 IF A <> code THEN NEW
4 Continue the program here
```

Sean Fitzpatrick
St. John's, Newfoundland
Canada

$172 Magic program protector—This procedure will give a rather secure no-list protection to any C-64 Basic program. First, enter the following line exactly, with no embedded spaces except where shown. Be careful, as the line is designed to list in a very tricky manner.

```
0 P{SHFT O}2126,98:P{SHFT O}2127,8:REM""{DELETE}
  {CTRL RVS}{28 T's}{CTRL RVS OFF}
  {SPACE}REM{SPACE}"PROTECTED BY MAGIC"
```

Once it is entered, do *not* run it. Instead, make this Direct mode entry:

```
FOR X = 2125 TO 2127 : PRINT PEEK(X) : NEXT
```

If three zeroes are printed, line zero is correct; otherwise, enter it again from the beginning. When you have the three zeroes, enter this line:

```
1 POKE 2126,0 : POKE 2127,0
```

Once again, do *not* run the program. *Do* save it, giving it some descriptive name, like Magic Protector.

Now you are ready to test the protection routine. Add some simple program to lines 0 and 1; something like

```
10 PRINT"HOUDINI"
```

is good enough, but the program can be as complex as you'd like. Run the program to satisfy yourself that it works, then try to list it. If all has gone well, nothing but the last part of line 0 will list, but the program will run perfectly. Any attempt to add or delete lines will corrupt the program.

Now, whenever you want to protect a program, just append it to Magic Protector. The first time you run it, everything but line 0 will disappear, and non-magicians will be hard pressed to crack your security. The program can be saved in its protected form, allowing you to give copies to others without letting them see the code.

Hugo Vasquez-Aragon
Lima, Peru

$173 SX-64 TV display—The SX-64 lacks a built-in RF modulator. To display its video signal on a TV, you can avoid an external modulator if you have a video cassette recorder. Just plug the video output of the SX into the input of the VCR, and look at the output of the VCR on your TV.

D.L. Jassby
Princeton, NJ

$174 Soap opera computing—Watching a blank screen during long cassette loads becomes very

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e card.

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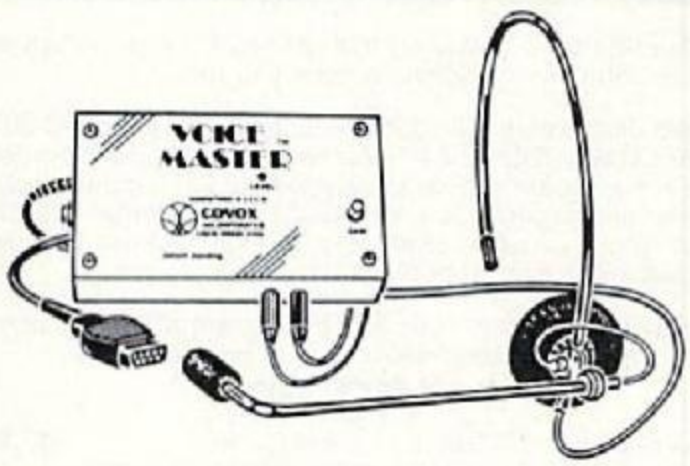

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boring. If you are using a TV as a monitor, you can solve this problem by flipping the TV/computer switch and watching some television. Switch back when the cassette drive stops, and your computer program will be waiting.

Steven J. Walsh
Seaford, NY

$175 Flagrant chauvinism

—The accompanying C-64 program shows the colors on your video display. Vexillologists will love the picture, in spite of the flaw in the canton.

Kevin D. Skorupa
Biloxi, MS

```
1Ø REM ** FLAGRANT CHAUVINISM **
15 A$="{4 SPACEs}"+CHR$(18)
2Ø B$=CHR$(146)
25 C$="{16 SHFT SPACEs}":C$=C$+C$
3Ø D$=" * * * * * * * *"
35 E$="{HOME}{3 CRSR DNs}"
4Ø F$=A$+C$
45 G$=A$+B$+C$
5Ø H$=A$+RIGHT$(D$,13)+B$
55 J$=A$+LEFT$(D$,13)+B$
6Ø POKE53265,91:POKE5328Ø,Ø:POKE53281,Ø
65 POKE53282,1:POKE53283,6:POKE53284,2
7Ø PRINT"{SHFT CLR}{CTRL 2}"E$
75 FORX=1TO6:PRINTF$CHR$(141)G$:NEXT
8Ø PRINTF$E$
85 PRINTH$,,,J$,,,H$,,,J$,,,H$,,,J$,,,H$
9Ø GOTO9Ø
```

$176 C-64 special effect

—This one-liner will blow your socks off. Watch it run for a while, then press and hold down the space bar. You need a color display to see the full effect.

```
1 FOR X=0 TO 1 STEP 0 : POKE 53280,3 : POKE 53280,6 :
  NEXT
```

After replacing your socks, you can try replacing the 3 and the 6 with different numbers.

Mark Mankins
Malvern, OH

$177 Color-coded disks

—For easy identification of disks, use colored strips of electrical tape. Use different colors for each type: blue = games, red = utilities and so on.

David Barrowman
St. John's, Newfoundland
Canada

$178 Magnetic fields

—We've all heard about the danger of storing your disks close to the monitor or TV. Possible magnetism could wipe out your

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whole library. If you worry about this sort of thing, place a small magnetic compass between the set and the proposed location of the disk box. If the magnetic field is dangerous to the disks, the needle will swing whenever it's in the field.

Jim Stephens
Nashville, TN

$179 Inexpensive disk mailers—To make my own disk mailers, I cut two squares of corrugated cardboard slightly larger than a disk and its envelope. Then I put the disk between them, making sure the corrugations on the two pieces run at right angles to each other. When I tape the four corners, the resulting sandwich is strong, light and compact, and can be mailed in any envelope large enough to hold it. Photographers have used this method for years, and their valuable prints are seldom damaged in the mails.

Alan Sperling, Esq.
Mount Lebanon, PA

$17A Appending to files—There is a command that can be used on the 1541 disk drive to add data onto an existing sequential file.

```
200 OPEN 3,8,3,"0:FILENAME,S,A"
```

The A stands for append; for some reason, this command is not in the owner's manual for the 1541.

Keith Marshall
San Juan, Trinidad

$17B Printed disk directories—If you set your printer on condensed pitch with a small line feed, the printed directories will be physically compact. These small printouts can be taped to the disk sleeve or put into a binder. On my Gemini printer, I do this:

```
LOAD"$",8
OPEN 4,4 : CMD4
PRINT CHR$(15) CHR$(27) CHR$(48)
LIST
```

On the Commodore 1526, a similar effect can be gotten by entering:

```
OPEN 6,4,6 : PRINT#6,CHR$(22) : CLOSE6
LOAD"$",8
OPEN 4,4 : CMD4 : LIST
```

The characters won't be any smaller than normal, but the line spacing will be very tight.

George Hu
Renton, WA

**$17C Underlining with the 1526**—There's a rumor going around that the 1526 won't underline. But CHR$(141) gives you a carriage return without a linefeed, allowing you to overprint the line from the beginning. Try this for a demonstration:

```
10 OPEN 4,4
20 PRINT#4,"THIS IS A COMMODORE
   PRINTER"CHR$(141)"{10 SPACES}{9 COMD @}"
30 CLOSE4
```

Marion Deland
New York, NY

$17D Programming trick—While programming, if you are not sure whether a line must be deleted, just insert a REM statement at the beginning of that line. This way, the line will not be executed if you run your program, and you'll be able to know if you have to keep it in.

Alain Niquet
Alma, Quebec
Canada

**$17E Printing quotes**—If you want to print quotation marks, you'll soon discover that you can't put them inside a Print statement. The solution is to Print CHR$(34).

Andrew Apold
Panama Canal Zone

$17F Program delays—To halt your program until a key is pressed, try this:

```
10 PRINT "PRESS ANY KEY TO CONTINUE"
20 POKE 198,0 : WAIT 198,1:POKE 198,0
30 Program continues here
```

Andres Rios
Montevideo, Uruguay

$180 Easier C-64 sound—To get good ADSR settings, you don't need to go to the manual and spend all afternoon adding numbers until you get a sound you like. Instead of that, you can do this (for voice #1):

```
100 POKE 54277,16*A + D : POKE 54278,16*S + R
```

where A = attack, D = decay, S = sustain and R = release. The values must be between 0 and 15.

Sergio Daniel Freue
Buenos Aires, Argentina

$181 Speedy execution—There are two ways of putting polynomial calculations into a Basic program. One closely duplicates the normal algebraic notation, while the other uses parentheses and looks somewhat unusual. The unusual-looking method is illustrated below, along with proof that it is much more rapidly executed than the standard method.

```
10 A = 2 : B = 3 : C = 4 : D = 5 : X = 2.5 : T = TI
20 FOR I = 1 TO 100
30 Y = A*X + B*X12 + C*X13 + D*X14
40 NEXT
```


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```
50 PRINT "TIME = "TI - T,"ANSWER = "Y
60 T = TI : FOR I = 1 TO 100
70 Y = (((D*X + C)*X + B)*X + A)*X
80 NEXT
90 PRINT "TIME = "TI - T,"ANSWER = "Y
```

Dennis P. Dykstra
Vienna, Austria

$182 Calculated GOTO—This routine lets you go to a line number that is calculated within your program. To use it, just set variable GL equal to the line number to be executed, then enter GOTO 63000. The routine can be put in any three consecutive lines, provided the third line is typed exactly as shown here, with no spaces between any of the characters.

```
63000 GL$ = STR$(GL) : LN = LEN(GL$) -
  1 : GL$ = RIGHT$("0000" + RIGHT$(GL$,LN),5)
63010 FOR DI = 1TO5 : BY(DI) = ASC(MID$(GL$,DI,1)) :
  NEXT DI
63030 AD = PEEK(62)*256 + PEEK(61):FORDI =
  1TO5:POKEAD + 51 + DI,BY(DI):NEXT:GOTO00000
```

The routine works by Poking memory to change the last characters of the third line. You can test the routine by setting GL, then executing it, then listing it. In the listing, the 00000 should be replaced by the value of GL.

Douglas Johnson
Evesham, England

$183 Normal distribution—The normal distribution, or bell-shaped, curve is a useful tool in statistics and quality control. If ME is the mean of the distribution, and SD is the standard deviation, this line will produce Xs that are randomly distributed.

```
100 X = ME + SD*((-2*LOG(RND(0)))
    {UP ARROW}.5*COS(2*{PI}*RND(0)))
```

Put the line in a For. . .Next loop, and it will generate as many numbers as you'd like. INT(X) could be used to generate integers, if that's your pleasure.

Frank Biondi
Pittsburgh, PA

$184 Toggling—If you need to toggle between two values in a program, set the toggle variable to one of the values, then use:

```
TG = [sum of the two values] - TG
```

For instance, if the two values were 3 and 7, you'd execute TG = 10 - TG each time you needed to toggle the value.

There's also a quick way of toggling between three or more values, as long as there's a regular relationship between them. Without going into the details, the formula for values of 1, 2 and 3 is:

```
TG = TG + 1 + (TG = 3)*3
```

With a little work, the formula can be adapted to work with any regular sequence of values.

Clay Carr
Westerville, OH

$185 C-64 cursor tricks—You can speed up your cursor with POKE 56341,1. You can slow it down with POKE 56341,255. If you combine these tricks with POKE 650, any value over 127, you'll discover some real fun.

Harry I. Papatheofilopoulos
Peristeri, Greece

**$186 VIC time clock**—If you have the Super Expander, you can find out what time it is by pressing the f1 key. Just set TI$ to the current time, then enter:

```
KEY1,"TIME = " + TI$
```

Reinaldo Martinez
Rio Piedras, Puerto Rico

$187 Reset tip—The C-64 Reset command SYS 64738 will not disturb most machine language programs in memory, but it does seem to wipe out anything in the cassette buffer, locations 828–1019 decimal. Safe areas for machine language programs are Basic RAM, 2048–40959, and alternate RAM, 49152–53247.

Peter Heine Jorgensen
Aarhus, Denmark

$188 C-64 uncrasher—When your keyboard locks up while you are typing, try typing {SHFT 3}. The screen should respond with "Press Play On Tape," and if you follow those instructions then press the stop key, you should be able to continue your work.

Douglas P. Oesterle
Agana, Guam

$189 Error messages—Memory location 157 ($9D) controls whether or not error messages and control messages will be displayed on the screen. In Direct mode, for instance, Loading, Searching and Found messages are displayed, while in Program mode they are suppressed, all because of different values Poked into location 157. You can control the display yourself as follows:

```
POKE 157,0—Suppress all messages
POKE 157,64—Enable error messages
POKE 157,128—Enable control messages
POKE 157,192—Enable error and control messages
```

Mike Tranchemontagne
Nashua, NH

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$18A If...Then...Else—Unfortunately, Commodore Basic doesn't have this useful construction, which allows you to redirect the program if the If statement fails. You can use the ON...GOTO statement to give a similar effect, as in this example:

```
400 GET A$ : IF A$="" THEN 400
500 ON((A$="Y")+2) GOTO 600 : ON ((A$="N")+2) GOTO 700 :
    GOTO 400
600 PRINT "YES" : END
700 PRINT "NO" : END
```

Note how the two tests have been put on the same program line.

Mike Sokolewicz
San Francisco, CA

$18B STOP and CONT—These two commands can be used as valuable debugging tools. CONT will restart a program that has been halted by the stop key, or by an End or Stop statement. Execution will continue from the statement following whatever caused the halt.

You can put STOP into your program at various test points. When the program encounters a Stop command, the number of the last line executed will be shown on the screen, proving that the program reached the line in question. While the program is halted, you can check the value of variables, and can even change them if you'd like. A Direct mode CONT will, of course, resume program execution.

Charles Brogdon
Dalton, GA

$18C Uses for REMS—REM statements are much more helpful then just describing a subroutine or giving credit to the program originator. I use them at the beginning of each program to list the source and location of the program, plus any special instructions that may be required in using it. It saves me from having to dig through stacks of magazines trying to find the article. For example:

```
10 REM FILE HANDLER—RUN FEB 84 PAGE 48
20 REM USE SPACE BAR TO SKIM PAGES. USE RETURN TO
   SKIM CATALOG.
```

Howard VanDover
Trenton, MI

$18D Timekeeper—For an easy way to keep track of time while programming, try this: As soon as you turn on your computer, type the following in Direct mode.

```
TI$="hhmmss"
```

where hhmmss is the correct time in hours, minutes and seconds. Then, whenever you want to know the time, just type PRINT TI$, and your built-in clock will tell you. You should note that the clock isn't extremely accurate and will be slowed down by tape operations, but it's good enough for most purposes.

Darren Atwater
Delta, British Columbia
Canada

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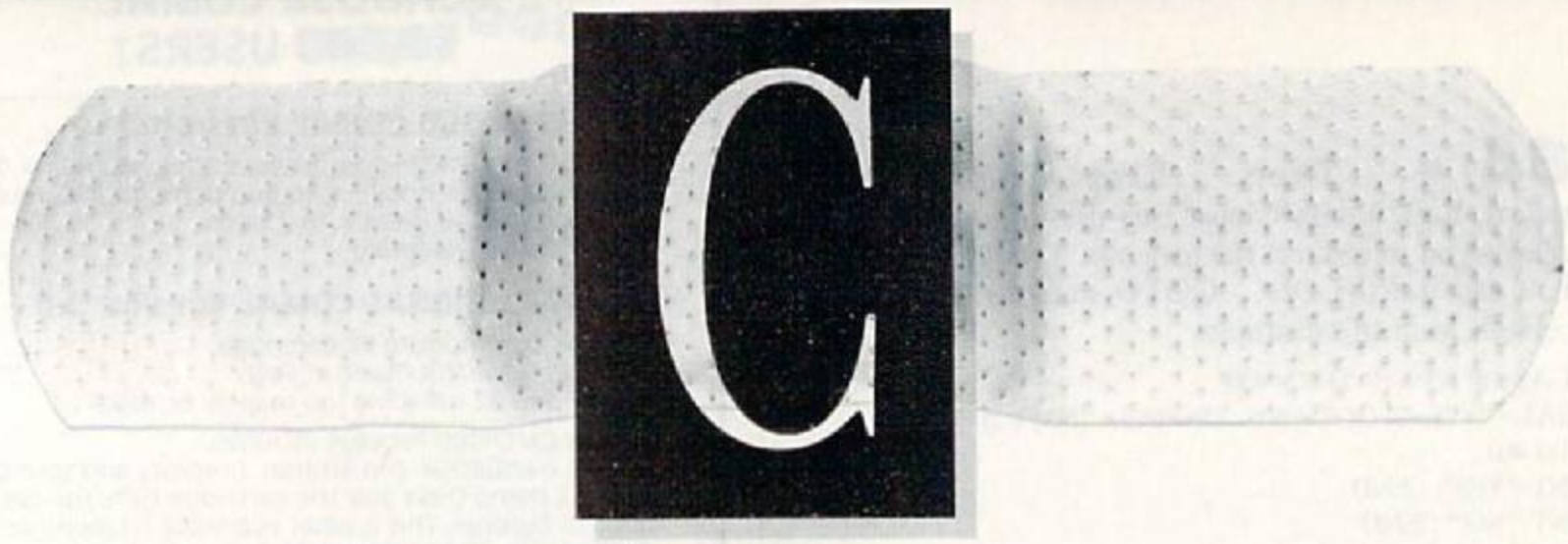

JIM STRASMA

Commodore Clinic is a monthly column designed to help you through any troubles or questions you have as you use your Commodore computer. Send questions to:

Jim Strasma
Commodore Clinic
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Lincoln, IL 62656

So this column can help as many people as possible, please try to send no more than one question a month, and ask about topics of general interest. Including a full-sized (#10) self-addressed stamped envelope will ensure a reply even if your letter does not appear in print. I do ask that you not call, though, because my telephone does not know how to type, and only questions that get typed can help others through this column.

Software

Q: I recently bought a B-128 computer from Protecto Enterprises. I'm happy with the various components and their performance, but I need better documentation. The book that came with it is very poor. It mentions a programmer's guide, but I haven't been able to find it. You once mentioned your *PET Personal Computer Guide*. Could you steer me in the right direction to obtain documentation on the B-128?

Bob Wingerter
Raceland, KY

A: I recommend two reference books for CBM computers. One is my own *CBM Professional Computer Guide*, a sister volume to the *PET Personal Computer Guide*, both from Osborne/McGraw-Hill. If your local dealer doesn't have it in stock, I have nine copies available for $18 each, postpaid. The other is *Programming the PET/CBM* by Raeto West, available from Holford Enterprises (6065 Roswell Road, Suite 1398, Atlanta, GA 30328), for $28 postpaid. It begins where my book ends, and serves as its Volume 2. I've never seen an unfavorable review of either book.

Unfortunately, both were written just before the actual release of the B-128, so neither book covers all of the new features, nor do their memory maps apply. Since the B-128 is a discontinued machine, other manuals specific to it are unlikely to appear. You could try phoning Commodore about the *Programmer's Reference Guide*. I have seen parts of it, but haven't seen a completed copy.

Since many have asked, here's one more word on the B-128. If you are willing to be limited to the few excellent programs already available for it, Protecto's price is a real bargain.

Q: Can you suggest a program or system that would save the machine language program that I understand is developed by Basic and that the 64 actually executes. I'm looking for increased speed.

Charles Pocatille
Clifton, NJ

A: To compile your programs, you need a compiler, such as Blitz, from Skyles Electric Works (Mountain View, CA), DTL Basic, from Cimmarron, or PETSpeed64, from Commodore. Without one of these, or some other compiler, the process you describe doesn't actually happen; rather, each instruction is converted to machine language as it is interpreted, then obeyed and forgotten. If it is seen again, as it might be in a loop, the whole process must be repeated. That's the reason for Basic's lack of speed as well as its ease of use.

Q: I own a 64 and a Datassette. Is there any word processing program I could obtain that comes on a cassette tape?

David Amaral
Barrington, RI

A: I can recommend at least two cassette-based word processors: Text Master 64, from Universal Systems (Box 126, Urbana, IL 61801), and Totl.Text 2.5 (VIC) or 2.6 (64), from Totl Software (Walnut Creek, CA). For a bit more money, you might also want to consider Write Now!, from Cardco (300 S. Topeka, Wichita, KS). It comes on a cartridge, in versions for the VIC or 64, and has a cassette load and save option.

Q: Can you save a picture made by a light pen and use it in another program; for example, in a graphics adventure?

Marinus Schouten
Harlem, The Netherlands

A: There's no automatic reason you couldn't, but it depends on the features of the controlling program. Flexidraw, for example, easily lets you save

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a picture, but its manual does not describe loading pictures into another program. Even so, it can be done. Paint Magic, a similar joystick drawing program from Datamost (Chatsworth, CA), was used to draw the pictures loaded and displayed at the start of their games for the 64. Specifics of saving and loading will depend on the light pen and program you use.

Hardware

Q: I have a problem. I bought a CP/M cartridge for the 64 and found out that it does not work on my new 64, which has the −03 Kernal ROM. The CP/M works on older models.

Zoltan Szepesi
Pittsburgh, PA

A: The CP/M problem is apparently caused by timing changes in the new Revision 8 of the VIC II chip, not by the −03 Kernal ROM. If so, it should work fine in your new 64 as soon as you swap VIC chips with someone who has an older Revision 2 or 5 chip. Unless he plans to use CP/M, a dealer or another user should be glad to make the swap, since the Revision 8 chip is in all other respects an improvement on the earlier designs.

Q: I have one Commodore 64 system at home and another at the office. I recently discovered that disks formatted on one 1541 drive will not load reliably from the other, and vice versa; however, both drives will load disks formatted on their own particular drive. Each unit passes the performance test program on the demonstration disk that comes packed with the unit.

I assume the trouble lies with a calibration problem on one or both drives. I have heard rumors of a software package that provides instructions for calibrating malfunctioning 1541 disk drives. Is such a product available commercially?

Albert Wellman
Santa Rosa, CA

A: I agree with your diagnosis. One or, more likely, both of your 1541s are somewhat out of alignment—not enough not to load a disk formatted by a properly aligned drive, such as the test/demo disk, but enough to be incompatible with each other.

To make sure, you could buy the new 1541 Physical Exam program from Cardinal Software (Woodbridge, VA 800-762-5645). It will quickly and easily show you whether or not your drives are properly aligned, and, if they're not, will show you in a simple graph which direction they are off and how far. It will also test the Track 0 stop and the motor speed. If you are mechanically inclined, you can use this information to make corrections. In addition, the brief manual does include instructions on the necessary steps involved. Surprisingly, Cardinal also reports that the 1541 is designed to operate at 310 rpm, not 300 rpm like other drives.

Q: There's a man in Mesa, AZ, who just invented something he calls the miracle chip, with up to 512K for about $50. Fits any microcomputer. My question: with 512K and a few lines of graphics definition, would my VIC perform as well as, or better than, a 64?

Ken Lansing
Sierra Vista, AZ

A: 512K bytes of RAM memory in 1985 would indeed be a miracle. I rather expect the man is offering 512K *bits* of memory for that price, a far lesser bargain (512K bits = 64K bytes). And, no, a 64K VIC, modified with any amount of special programming, is *not* a 64. On the other hand, it may be quite adequate for your needs. There's no need to pitch or change any computer that still does what you need it to do. Are you sure this isn't the new W655C802 microprocessor from Western Design Center, rather than a memory chip?

Q: My 1541 drive will load, but will not save, programs. Something may be out of alignment, because shortly before this, the write-protect tab on a disk came loose in the drive; it had to be pulled out and offered some resistance. Does this seem likely to be the cause? If so, do you think it's a problem that can be corrected at home?

James Grossie
Houston, TX

A: Yes, a write-protect tab caught in the drive can indeed cause the drive to load but not save programs. The write-protect sensor in the 1541 is optical (triggered by the breaking of a beam of light by an opaque object). Any opaque object trapped within the path of that beam will prevent the drive from saving programs.

As for correcting this situation, the first thing to try would be a can of compressed air with a narrow flexible nozzle that can be inserted into the disk slot. Use it to blow any dust or other foreign materials out of the write-protect sensor, which is located at the left end of the disk slot.

If this fails to correct the problem, you or a dealer may have to disassemble the drive and pick any remaining debris out of the sensor. This is a matter of removing about a half dozen screws, so you might be able to handle it yourself if you are mechanically inclined and your 1541 is out of warranty.

If, however, anything has been moved out of position or broken in the mechanism itself, you will probably need the help of a dealer's service department to fix things properly. But unless something is broken or other work is needed, the time required should be minimal.

Q: Recently the carriage returns on my 1525 printer became slower and slower. Now the head doesn't reach the next line without a nudge. Can you tell me what's wrong?

James Ryan
Winthrop, MA

A: Unlike most printers, Commodore's 1515, 1525 and MPS 801 use a spring to return the head to the left end of the print line after finishing a line. One of two things has probably happened to your printer. Either the spring has become fatigued after use (it's less springy) or it is binding due to foreign matter in the mechanism or lack of lubrication (it's more sticky).

First, open the cover and use a can of compressed air to blow out any paper,

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dust or other contaminants that may have accumulated. That may do it. If not, see if there is an adjustment for the spring, to make it tighter, or if your manual mentions a lubrication procedure. I don't have a 1525, so I can't be more specific. If you don't find the solution, take the printer to a full-service dealer for repair.

Q: Recently, my 64 broke down and I sent it in to be exchanged. A couple of days' testing produced no problems with the replacement. Then I connected a Dinset (from Public Domain, Inc.) to it. The first time I used it, the screen turned blank, then returned colorless except for a light green line at the top. I had to turn the computer off and on several times to get the normal blue screen.

I stopped using the Dinset, but occasionally after a long session and a program lock-up that requires turning the computer off and on, I have to turn it off and on three to four times to get a normal screen. I wrote Commodore, but their only comment was, "If your computer has a problem, return it and we'll replace it."

I don't want to risk another long wait for exchange if the problem isn't serious. However, neither do I want to wait until the warranty expires, only to have the computer break down again.

Should I return it? And does the Dinset harm computers?

James Barnes
Dallas, TX

A: If it were mine, I'd exchange it. Something inside the computer has definitely been cooked enough to fail when hot. If the delay is a problem, some full-line Commodore dealers will do the exchange over the counter for a fee.

As for how it happened, there is a chance that it was a preexisting problem in the exchange unit, but I doubt it. It was most likely caused by your plugging in the Dinset while the computer was turned on. You can't safely plug any accessories into the 64 while the computer is powered up. Always turn the computer off before switching plugs. Even swapping joysticks from one port to the other with the power on has been known to blow chips.

Less likely, but still possible, is a failure from using the Dinset after plugging it in with the power off. In that case, your Dinset might be defective, perhaps shorted out. Another possibility is that the Dinset is working normally, but that its use still results in a failure. If the reset line of the microprocessor is simply grounded to initiate a reset, there is a small chance of harming the microprocessor. To prevent this, some reset circuits include a small resistor to ease the shock to the chip when doing a reset. I don't know whether or not the Dinset includes such protection.

The traditional reason for using a reset switch on Commodore computers—preventing the stress of turning the display off and on—doesn't apply to the 64. Therefore, unless you are using an expansion motherboard with multiple cartridges, I see no reason for using a reset switch on the 64. If you *do* use a motherboard, those I've seen already include a reset button.

Q: Recently, my VIC has blown three fuses. It also gets very hot. Why does this happen?

Mike Wickett
Sacramento, CA

A: My first guess is that you've added some accessories to your VIC—enough to cause the problem. Everything you connect to a VIC adds to the power it requires. This includes cassette recorders, modems, joysticks, expansion motherboards, added memory, program cartridges, 80-column cards and some interfaces. The VIC's power supply was not designed to operate a system that tries to operate several of these accessories at once. The cure is to unplug some of the extras when using others.

If yours is an early version of the VIC, it may run hot even without lots of accessories connected. Units made in the last year or two run cooler than the original design. Those of you with older VICs may want to consider getting one of the commercially available cooling kits advertised occasionally in the magazines. Unfortunately, I've not tested any, so can't recommend one.

If you aren't using any more accessories than when your VIC didn't blow fuses, another possibility is that some component of your computer is failing. If so, the unit needs repair.

Q: We hooked up our 64 to a TV whose screen is 10¼ inches wide, and whose border area is 1¼ inches, leaving the background we type on only 8¾ inches wide. It seems too small. Is this correct, and is there any way to make the border smaller and the usable area larger?

Frank Ross
Willcox, AZ

A: It's correct for the C-64 to have a wide border. This is to accommodate TVs with a high degree of overscan. To ensure that every TV can display the entire text area, the text is limited to the central portion of the screen.

To make the text area more completely fill the screen, you could have the overscan on your TV adjusted by your TV dealer. Or perhaps another reader has found a way to modify the VIC II chip to do the same thing on the Commodore 64.

Q: My next priority purchase will be a keypad, but I can't get sufficient information to make a decision as to which to buy. Does Cardco's just plug in like a joystick? I would prefer a keypad that feels like a ten-key calculator, with plus, minus, decimal and so on.

John and Coral Williams
San Saba, TX

A: The only plug-in keypad I've tested is the Cardco. Yes, it can just plug in like a joystick. Connected that way, you'll need to load a small machine language driver program each time you want to use the keypad.

Occasionally, you'll find that a commercial program won't work together with the driver program. In such cases, or to avoid the inconvenience of loading a program each time you use the keypad, Cardco offers an optional internal connector that plugs into the keyboard connector inside the 64. Except for the minor inconvenience of having to open up the 64's case to install it (thereby voiding the warranty if the

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computer is new), this is probably the best solution for those who will use the keypad regularly.

Q: I have heard that it is possible to upgrade the VIC-20 a little by replacing the 6502 with a chip known as a 65C02, which is 100% compatible with existing software and so on. Is it a drop-in replacement?

P. Meehan
Yagoona, Australia

A: The Rockwell 65C02 is a CMOS version of the 6502, with some added instructions. It is used in the Apple IIc computer, and I, too, have heard it is a drop-in replacement for the 6502 on other computers. However, I haven't heard from anyone who has actually used it.

As for 100% compatibility, the added commands will keep that from being quite true. Some programs use unimplemented operation codes on the 6502, typically as part of a misguided protection scheme. Previously unimplemented operation codes that are used by the new chip for its added commands may cause such programs to fail.

Even more interesting is the still newer W65SC802 chip from the Western Design Center (Mesa, AZ). It, too, claims to be pin-for-pin compatible with the 6502 and offers 16-bit registers like the IBM PC's 8088 microprocessor. It includes so many new commands that there are no unimplemented operation codes on it at all. It also has a Default Emulator mode that lets it run existing 8-bit programs unless they use unimplemented operation codes. Apple has been rumored to be planning to use it in an as yet unreleased new version of the IIe.

This is one time VIC owners have it over 64 users. The 64 uses the 6510 rather than the 6502. Therefore, the 6510 can't easily be replaced with the new substitutes.

Q: I would like to use a Radio Shack CGP-220 7-color ink jet printer with my 64. I'm having difficulty finding what I need for an interface, especially in light of the need for color graphics dumps. Can you help?

Charles Baker
Topeka, KS

A: Designing software to handle the color graphics dumps will be up to you—those supplied for Radio Shack computers will need modifications to work with the 64. You might write the various companies with paint (drawing) programs for the 64, to see if any of them have a suitable color screen dump for the CGP-220 in the works. At last summer's MARCA Fair, for instance, I saw a new Okidata color printer printing a picture made by Doodle (from City Software, Milwaukee, WI) in full color.

As for the hardware, the CGP-220 is listed as using a standard Centronics parallel interface. Many suitable interfaces that plug into the serial bus are on the market now, including Micro W's MW-350 (Butler, NJ), Tymac Control's The Connection (Franklin, NJ) and Cardco's Card/? + G (Wichita, KS). However, none I've seen provide Commodore graphics characters on Radio Shack printers as yet, so you'll have to do without full emulation of the 1525 printer.

Q: Can I hook up my 64 to a video recorder? I was considering video birthday cards.

Joe Sleeting
N. Aurora, IL

A: Yes, the 64 works fine connected to a VCR—that is one way of improving its video quality on some TVs. The 64 can be plugged into either the VHF-IN jack, using an RCA phono-to-RCA phono cable and RCA phono-to-F Connector adapter (Radio Shack sells both), or can be plugged into the video- and audio-in phono plugs from a standard monitor cable for the 64. (If your C-64 has individual chrominance and luminance pins, you'll have to use a "Y" connector to connect them both to the video-in on the VCR.)

Q: I have a VIC and recently went to a Sakata monitor, which has no speaker. I made a video cord using a 5-pin DIN plug and pins 2 and 4 for the monitor. Could you please tell me how to tie in an external speaker? I tried a 9-volt battery speaker/amp, but got very poor results, with a lot of static and annoying interference.

Alan Hurlbut
Omaha, NE

A: So much for my recommendation last month (get a battery speaker/amp, which Radio Shack sells in low- and high-power versions, and which I've used successfully). The next two alternatives, also mentioned last month, would be to connect the audio-out wire from the monitor cable to the auxiliary input of a stereo system, or trade for a monitor with a built-in speaker. However, I'd like to suggest one more alternative. Your homemade cable could be the source of the noise and interference you report, either because it is miswired, has a cold solder joint or some other problem. Find a friend with a Commodore monitor cable and see if that one works better for you.

Q: A friend saw an ad for a VIC interface that simulates a BSR-X10 controller. With such a system, you can send signals through existing house wiring to modules that turn lights and appliances on or off. With the VIC, you could build some intelligence into such a system. I cannot locate the device, though I know a similar device exists for the Apple and TRS-80. Can you help?

Mack Cullen
Bethany, CT

A: One advertiser of what you're seeking is Genesis Computer Corp. (Box 152, Hellertown, PA 18055). The product is called the VIController, and is advertised in versions for both the VIC and 64. Last summer, Genesis displayed one at the MARCA Fair, but didn't seem interested in demonstrating it or having it reviewed.

Q: I have a VIC and am going to buy a 64. I'd like to connect both computers to two terminals in the house. How could I do this?

Ismael Juan
Madrid, Spain

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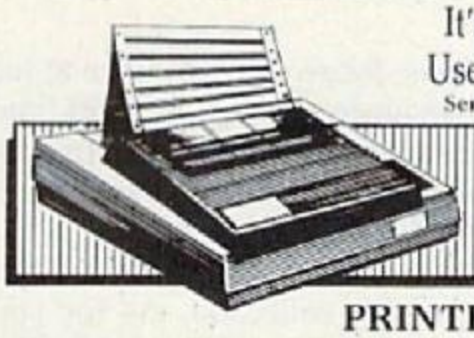

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A: It is possible for both a VIC and C-64 to share a common disk drive, printer and other serial bus accessories via a networking adapter. The only one I've tested is the VICSwitch, by Handic Software, a Swedish company with a U.S. branch at 520 Fellowship Road, Mt. Laurel, NJ 08054. The VICSwitch links up to eight devices on the serial bus, and works well as long as no one turns his computer off and on while the network is in use or leaves disk files open when not actually reading or writing data.

I'm not sure, but would rather expect you could get a European version of the VICSwitch from the parent company, if not from the U.S. office.

Programming

Q: My Commodore 64 goes dead for several minutes after running a program for a little while. The larger the program's arrays, the longer the dead periods. I have run the program on four different C-64s with the same result.

Dan Walsh
Windsor, CT

A: You have discovered garbage collection. It is found in nearly all Microsoft Basics. Although the usual delay ranges from a few seconds to a few minutes, I once heard of an Apple owner who managed to lock up his machine in garbage collection for two entire days.

When you run a program that uses calculated strings, Basic finds room for them at the top of memory. Then, when you change a string, Basic makes a new copy of it, a bit lower in memory. Eventually, you run out of memory, since it is filled with strings you no longer need. To correct this, a special garbage collection routine inside Basic packs the still-valid strings as close to the top of memory as possible, overwriting those that are no longer needed. Even at machine language speeds, this takes time.

One advantage of Commodore's new Plus/4 and 16 models, as well as the CBM and PET Basic 4 models, is that they have a much faster way of handling garbage collection. As for your 64, garbage collection can be minimized, but not eliminated. The guiding principle is this: Don't create any more strings than you have to, and change them as infrequently as possible.

Q: I use my VIC-20 with a 1525 printer to do my billing for a small company. My program works well, with one problem. I would like my billing to print out the two zeroes after the decimal point if there are no cents in the amount. Instead of $10, I would like it to print $10.00. Is this possible?

Gerald Wagner
Germantown, WA

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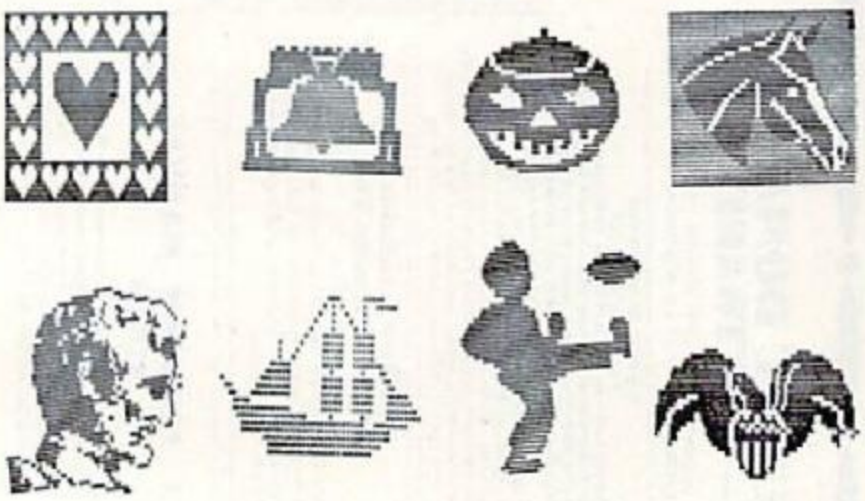

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A: Yes, but it will take a small subroutine. Given a number to be printed out, zeroes and all, in variable N, the following subroutine will print it.

```
1000 REM PENNY FORMATTER
1010 C=INT(100*N):REM CONVERT TO
  CENTS
1020 C$=MID$(STR$(C),2):REM
  CONVERT TO STRING
1030 LN=LEN(C$):REM FIND ITS
  LENGTH
1040 PRINT "$";LEFT$(C$,LN-2)
  ;".";RIGHT$(C$,2)
1050 RETURN
```

If your program will use the same formatted number several times, you could change line 1040 to:

```
1040 N$="$"+LEFT$(C$,LN-2)+"."+
  RIGHT$(C$,2)
```

and Print N$ later as needed. The reason for doing it the first way I've shown is to minimize the number of strings created, and thus the time required for garbage collection.

Q: **When I am making a program, my keys freeze up and don't work the way they are supposed to. Could you tell me what you think the problem is? I own a 64.**

Rodney Lloyd
Gary, IN

A: I can think of two likely causes. One is the "push-wrap crash" we've discussed before in the Clinic; you avoid it by changing the cursor color to white when writing a program or when you're upgrading to the current –03 Kernal ROM.

The other cause is premature testing of a program that contains a Poke statement. If, for example, your program includes POKE X,Y but you haven't assigned any value to X or Y yet, Basic will do a Poke 0,0, since 0 is the default value of unassigned numeric variables. Poking to location 0 on a 64 changes the data direction register that controls what chips are in and out of the memory map, which may eventually result in losing control of the machine, unless you know what you're doing there.

To avoid this and similar problems with Poke, always save a copy of your program before typing RUN, then if it crashes, you haven't lost anything but the time it takes to load it in again.

Q: **I am writing my own database program and have run into trouble. I want to use random files, instead of sequential files, because I will be continually adding data. I tried the programs on pages 31 and 32 in the disk drive user's manual. After several tries, all I got out was garbage. Can you help?**

Jim Smith
Charlton, MA

A: I have spent the last month rewriting and expanding the 1541 manual, in hopes of making it accurate, readable and comprehensive. By the time you read this, the result should be available from Commodore. The programs you tried use random files, and have been dropped from the new edition in favor of relative files, which are far easier for most people to use and still allow random access to data. I would suggest you alter your program to use relative files.

To go with the revised manual, there is also a revised test/demo disk, including a relative file demonstration program, improved versions of some programs on the original disk and several other new programs I've found useful. That, too, should be available from Commodore, or I can supply it for my usual $15 copying fee.

Q: **I recently bought a Brother Compactronic 60 electronic typewriter, along with their IF-50 interface and the proper cables. I also got the Commodore 1011A (RS-232) interface. I am using Easy Script, which takes RS-232 interfacing, but it asks for control and command register numbers, which I am having trouble discerning from the interface manual. The IF-50 also includes DIP switches.**

I fear a compatibility problem lurking here. The only thing I can get the system to do is the internal test of the IF-50 (automatic after warm-up). I have a continual pattern of "@" signs for whatever file is to be printed.

Jeffrey Prescott
Panorama City, CA

A: Let me refer you to my article on buying a printer in this month's *RUN*. It includes a section on calculating control and command register values for RS-232 accessories such as your printer.

Your immediate problem is a mismatch of baud rates (the printing speed of the interface and printer must match exactly). I don't know the switch settings of the Brother, but its manual will tell you which switches to set to get the following setting, which should work: 300 baud, 8-bit data, no parity, 1 stop bit, full duplex and XON/XOFF (3-wire) handshake. The matching numbers for the control and command registers are 6 and 0, respectively.

Q: **I have seen many programs with an XOR command in them. The Commodore 64 does not have this command in Basic. Could you please explain its use and show how it can be created using PET Basic?**

Robert Oesterreich
Costa Mesa, CA

A: XOR stands for eXclusive OR, a logical operation in which binary digits are compared and set to 0 (false) if they are the same, and to 1 (true) if they differ. The practical value of this ability is in flipping specified bits from on to off to on again.

For instance, it can easily be used to flip the screen into reverse field and back again, because doing so only involves flipping one bit in each byte of screen memory. A further advantage is that EOR (as it is known in assembly language) is nondestructive. That is, any change caused by its use may be undone by repeating the same command.

Given a value, A, that we wish to EOR with another value, B, we could use the following code, in assembly language and in Basic, respectively:

```
Assembly
LDA #A
EOR #B

Basic
A=(A OR B) AND NOT (A AND B)
```

In both cases, the result ends up in A (the A register in the assembly language version). This is one time assembly language is simpler than Basic. R

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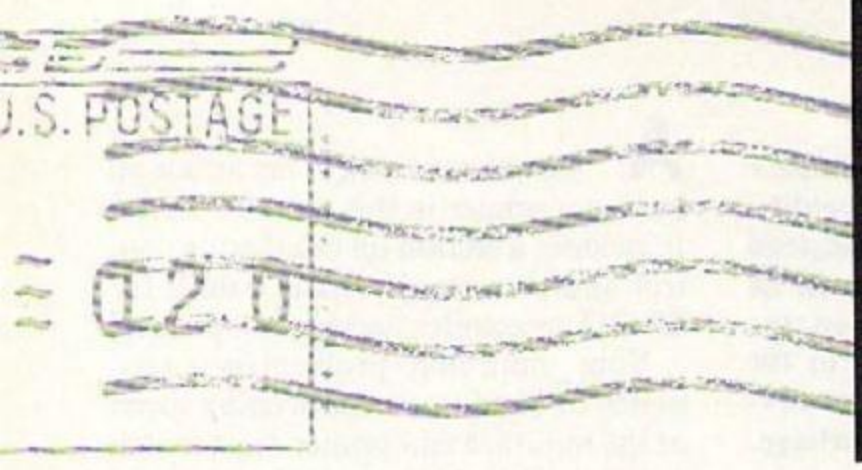

CP/M Compatible?

I, and probably hundreds of other Commodore 64 computer buyers, have a problem you should know about: My C-64 will not work with the Commodore 64 CP/M package.

According to Commodore's service department, Commodore is trying to fix the problem, but they have no estimates on how much time this will take. They took my name, address, telephone number, and the serial numbers of my computer and CP/M package. They also told me they would contact me when they had the problem corrected, but they didn't indicate what process I had to go through to get my machine fixed. One service person even suggested that I take my CP/M package and get my money back!

However, according to Commodore, there is a test you can perform to indicate whether your computer will or will not work with CP/M. Type the following line into your C-64, and then press the return key:

```
PRINT PEEK(65408)
```

If you receive the value "3," your computer probably will not work with CP/M. Values of "0" and "170" indicate that your C-64 probably is compatible with CP/M.

Although this test is nonconclusive, it may give you an indication of whether or not your computer is operative with CP/M.

Todd N. Ryan
Boulder City, NV

For a hardware solution to this problem, see "Commodore Clinic," p. 120 of this issue.

Editors

About Pascal

I was delighted that someone should finally point out that Pascal is available for the C-64 (*RUN*, October 1984, "Pascal," by Margaret Morabito). However, you made Pascal sound very difficult, when the procedures are actually quite similar. For example, it is true that you can't compile a Pascal program that refers to a procedure that doesn't exist. This is essentially the same as trying, in Basic, to Gosub to a line number that doesn't exist.

I am also writing to provide a *buyer's beware* tip. I have had ZOOM Pascal for around a year, and would not recommend it. The author of ZOOM Pascal also wrote (or helped to write) KMMM Pascal.

Anyway, I would suggest, as you did in your article, Oxford Pascal. The compiler can compile to disk (which means you can have enormous Pascal programs that link to each other) or memory. It has extra commands for sprites and so on. Also, it costs only about $49.95, while KMMM Pascal costs $99.95. For comparison, ZOOM Pascal costs $39.95. Seen from all points, Oxford Pascal is definitely the best buy, and the better product. Keep up the good work!

Robert Hayes
Irving, TX

Commodore in South Africa

Congratulations on a superb magazine. I like *RUN* because you supply us readers with all sorts of programs. As I read your July issue, I came across a letter from James Llanos of Ketchikan, AK: he wants to know more about Commodore users outside the United States.

Well, I, too, am a Commodore computerist, and I live in SWA/Nambia, which is in South Africa. The computerist is reasonably supported by some stores here in Nambia. We've got a chain of stores that exclusively sell Commodore products at a fairly reasonable price. However, we lack the support of good tape-based software. (When I see all the software advertisements in your magazine, I wish I were in the United States.) Therefore, I write my own programs and send them to a South African firm, where I get some pocket money.

Mr. Llanos also wanted to know how non-English-speaking people use English as a computer language. Well, I'm also not English speaking (I speak German), but I've been writing my own programs for 14 years. It is not that difficult to learn Basic in English.

Regarding hardware, we are better supported than with software. I own a C-64, which is the absolute hit over here. Also, I have an Epson FX-80, of which I am very proud, as not many people own this type of printer here.

If Mr. Llanos wants to know more about me and us Commodore users, he can write to me and ask for some detailed information.

I wish you Commodore fanatics luck, and I hope you always buy a Commodore, because it's number one!

Joern Staby
PO Box 9502, Eros
Windhoek 9000
SWA/Nambia
South Africa

A Vote for Panasonic

I would like to pass along some advice to those who are looking for an inexpensive Commodore-compatible dot-matrix printer that will print all of the Commodore graphics.

Recently, I purchased a Panasonic KX-P1090 and connected it with Cardco's Card/? + G interface. It works great. The printer can print in over 20 different print styles, including pica and elite. It will print in double-width elongated print or small compressed print. It faultlessly obeys all print commands I send it, and the best part about it is that it is comparatively inexpensive. I paid $267.

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I have seen many reviews of printers, but no one ever mentions the Panasonic. My friends have Gemini 10X, but after seeing mine in action, they prefer the Panasonic.

George A. Bilinsky
New York, NY

Try the Turboprint/GT

It seems so rare nowadays to buy a product that is fully backed by the manufacturer that I felt compelled to write and pass on the following experience.

I had been using a non-graphics interface to connect my Prowriter to my C-64, but I wanted to change to one with graphics capabilities. While browsing in a local computer store, I noticed a new interface that I had not heard of before—Turboprint/GT by Telesys, Inc. After reading the advertising flier, I decided to take a chance and buy it (the promise that I could return the interface if I wasn't satisfied also influenced my decision).

After getting the interface home, I experienced some problems with printer switch settings. I couldn't get the included screen dump program to work. I called Telesys and was referred to Bill Karoly, who was more than willing to help me solve any and all problems. (In addition, Telesys provides a toll-free number for you to call—800-252-4733.)

With Bill's assistance, I was soon using my new interface with all my software. He solved my problem with the screen dump program by copying the program on a blank disk that I sent him (I had made errors in typing in the program). Bill also provided me with the latest edition of their owner's manual and an updated ROM for the interface.

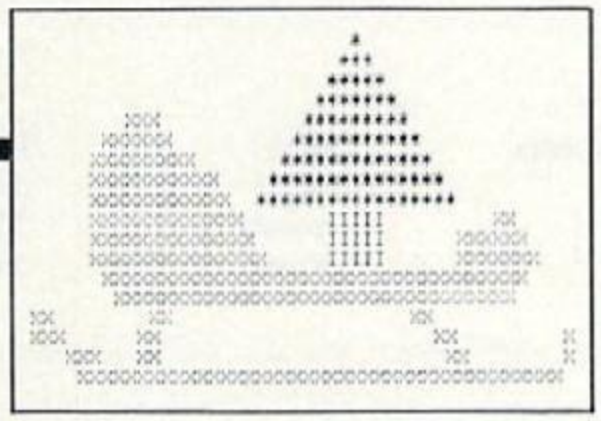
If you want a printer interface that most emulates a Commodore printer and total backing from the manufacturer, give the Turboprint/GT a try. You'll like it.

Bill Griffith
Boise, ID

The Sled

I am 12 years old and I love to work on my Commodore 64. Well, during the winter I love to ski and sled a lot. On Christmas, my grandpa and I put a lighted-up Christmas tree on a sled and pushed it around the block, and some people clapped when we walked by their house, and that is where I got my idea for the sled.

Robby Dahlby
Sparta, WI



```
10 REM THE SLED
20 PRINT
30 PRINT
40 OPEN6,4
50 CMD6
60 PRINT
70 PRINT TAB(31);"*"
80 PRINT TAB(30);"***"
90 PRINT TAB(29);"*****"
100 PRINT TAB(28);"*******"
110 PRINT TAB(12);"XXX          *********"
120 PRINT TAB(10);"XXXXXX        **********"
130 PRINT TAB(9);"XXXXXXXX       ***********"
140 PRINT TAB(9);"XXXXXXXXXX     ************"
150 PRINT TAB(9);"XXXXXXXXXXXX  *************"
160 PRINT TAB(9);"XXXXXXXXXXXXX     IIIII        XX"
170 PRINT TAB(9);"XXXXXXXXXXXXXX    IIIII      XXXXXX"
180 PRINT TAB(9);"XXXXXXXXXXXXXXX   IIIII      XXXXXXX"
200 PRINT TAB(10);"XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
210 PRINT TAB(11);"XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
220 PRINT TAB(4);"XX        XX                  XX"
230 PRINT TAB(4);"XXX       XX                    XX          X"
240 PRINT TAB(6);"XXX    XX                     XX         XX"
250 PRINT TAB(8);"XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
260 PRINT
270 PRINT
290 PRINT
300 PRINT
310 LIST
320 END

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NEW PRODUCTS RUNDOWN

Compiled by SHAWN LAFLAMME

You're the Suspect

In Suspect, you are a newspaper reporter who has been invited to an elegant masquerade ball. You're a friend of the hostess, wealthy socialite Veronica Ashcroft-Wellman, and your editor has asked you to record the event for the Sunday Living section of the paper.

In the magnificent ballroom of Ashcroft Farm, an historic mansion in Maryland, you mingle with blue bloods and power brokers, sampling caviar and champagne, enjoying the fine orchestra and the exotic costumes. It's a delightful evening—until murder halts the festivities and fingers begin pointing at you.

You have only a few hours to convince the police of your innocence. To bring back a good story for your editor, you'll have to figure out who committed the crime, and why.

Suspect is available on disk for the C-64. Retail price is $39.95. Infocom, Inc., 55 Wheeler St., Cambridge, MA 02138.

Check Reader Service number 400.

Breakin' with Your Commodore

Epyx, Inc. (1043 Kiel Court, Sunnyvale, CA 94089) has released Breakdance, a new game on disk for the Commodore 64.

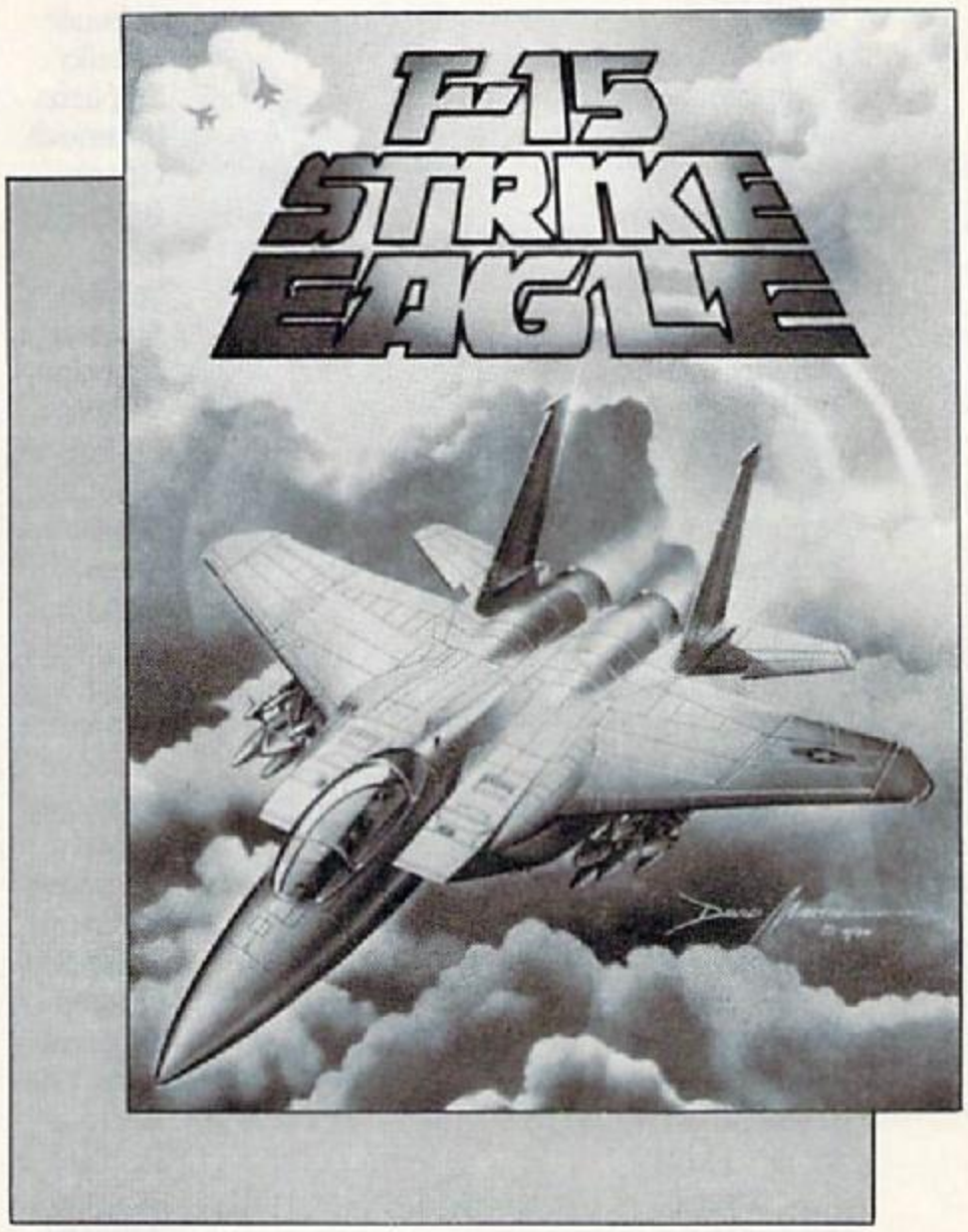
The program contains four separate games, each with graphics, animation and original, computer-generated music. In the free-form section of the program, you must choreograph your dancer's moves to match the rhythm of one of five different songs.

The game lets you use moves such as poppin', moon walking, up rocking and breakin'.

Check Reader Service number 401.

On the Campaign Trail

Strategic Simulations, Inc. (883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043) has released a Commodore 64 version of President Elect.



With President Elect, you can reenact any presidential election from 1960 to 1984, using any of the 45 actual, historical candidates (including Ronald Reagan and Walter Mondale). You can also program your own candidates, based upon responses to over 20 political and social issues. The computer reflects the prevailing political climate of the specified time, based upon economic factors and U.S. and foreign news.

The game can be played by up to three players, each assuming the role of a campaign manager/candidate. The game proceeds through nine weekly turns (Labor Day to election night), during which candidates must decide how to allocate campaign funds. Weekly polls are provided to give you a rough idea of how you're doing.

President Elect is available on disk for $39.95.

Check Reader Service number 402.

Combat Flight Simulator

F-15 Strike Eagle is a combat flight simulation program, from MicroProse Software (10616 Beaver Dam Road, Hunt Valley, MD 21030).

The program puts you in the cockpit of an F-15 Strike Eagle, one of the world's most advanced fighter planes. Many of the F-15's actual flight weapons and information systems are simulated in the program. The threats of modern air combat, such as enemy aircraft, missiles (radar-guided, infrared-guided and air-to-air) and well-defended ground targets, are included.

Seven different combat missions are included, from defending the fleet in the Gulf of Sidra against Colonel Kaddafi's forces, to protecting the strategic Persian oil routes in the Strait of Hormuz.

F-15 Strike Eagle is available on disk for the C-64. Retail price is $34.95.

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Commodore Customizer

The Operating System is a cartridge-based customizing component for the Commodore 64, from Hacker's Hardware (PO Box 7933, San Diego, CA 92107).

The component reconfigures the C-64's operating system, providing you with the following features: escape keys, quick load keys, default to disk drive, automatic machine language loading (with display of load addresses) and improved video displays. Over 18 resident utilities, including numerous DOS commands, programming aids and a directory function, are available during normal computer use.

The Operating System is available in either a standard model, or with an individually customized text display. Retail prices are $54.95 and $64.95, respectively.

Check Reader Service number 404.

C-64 Professor

Progressive Peripherals & Software (2186 South Holly, Suite 2, Denver, CO 80222) has introduced The Professor, a tutorial for the Commodore 64.

The Professor is designed to familiarize you with all the basic functions of the C-64. The program comes complete in two volumes on a two-sided disk.

Four general aspects of the C-64 are covered in this tutorial—the fundamentals of Basic, the keyboard and the functions of the individual keys, Music theory and simple to advanced graphics. The Professor is available on disk for $34.95.

Check Reader Service number 405.

Search and Destroy

Sonar Search is an action/strategy game that simulates the battle for control of the North Atlantic shipping lanes during World War II.

With your three destroyers, you must direct a search-and-destroy mission against five enemy submarines. Contacts are established with submarines as they come within your destroyer's sonar range. The submarines prefer to avoid contact with your destroyers, but they may attack with torpedoes when pursued. You must listen for torpedoes and take evasive action before they appear on your display.

To sink a submarine, you must maneuver your destroyer directly above it before launching a depth charge salvo. The game ends when all five submarines have either been sunk or have escaped to the open ocean, or when all three of your destroyers have been put out of action.

Sonar Search is available on disk or cassette for the Commodore 64. Retail price is $29.95. Signal Computer Consultants, PO Box 18222, Pittsburgh, PA 15236.

Check Reader Service number 406.

Save that Picture

The Graphics Magician Picture Painter allows you to store pictures in a minimal amount of space on a disk, so that you can recall them quickly from your own programs.

With this program, the computer stores the directions to draw a particular image, as opposed to storing the actual image, thus saving space on the disk. With the use of a joystick, you can choose from 16 basic and 71 blended shades to color in each character zone (the screen is made up of 1000 character zones). Eight "brushes," ranging in size from a small, precision brush to a large airbrush, can add detail and shading to your picture.

Available on disk for the Commodore 64, the Graphics Magician retails for $39.95. Penguin Software, 830 4th Ave., PO Box 311, Geneva, IL 60134.

Check Reader Service number 407.

Sticky Situation

Broderbund Software (17 Paul Drive, San Rafael, CA 94903) has released the Commodore 64 version of Gumball.

The game places you in the role of an apprentice at the Sticky Sole Gumball Factory. It's your job to sort all the gumballs. However, your supervisor, Mr. Nitpicker, is always attempting to undo your best efforts. Also, overzealous dental assistants try to blow up the factory using gumballs laced with explosives. When the four o'clock whistle blows, you'll have only one more hour to meet your quota.

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If you are successful, you'll be rewarded with a promotion and a colorful cartoon illustrating a dramatic increase in your standard of living.

Gumball is available on disk for $29.95.

Check Reader Service number 408.

Interactive Biology Program

Cell Defense is an interactive human biology program for the Commodore 64, from Human Engineered Software (150 North Hill Drive, Brisbane, CA 94005). It is designed to teach students aged 10 and up how the body defends itself from disease and adverse conditions caused by age, stress, drugs and alcohol.

The program simulates the spread of a virus through the body. The student must control the cell's defense system to prevent the body from being destroyed by virus infections carried in the blood.

The effects of age, stress, drugs and alcohol must be considered to determine the cell's ability to resist virus infection. Three types of cells need protection (skin, inner tissue and nerve), and the student can choose from interferon, macrophages, T-Cells, B-Cells and antibodies as defenses against the virus.

Cell Defense is available on disk for $29.95.

Check Reader Service number 409.

Join the Freedom Fighters

Datasoft, Inc. (19808 Nordhoff Place, Chatsworth, CA 91311) has released Meridian III, a futuristic war game for the Commodore 64.

Joining the ranks of the bravest Freedom Fighters, you must guide your heavily armed cruisers through enemy territory. Multicolored lights on your instrumentation panel give you instant energy reports and warn you of impending danger.

Your ultimate destination is the Dragon Lord's fortress city, which is heavily guarded by insidious Energy Globes and dreaded Space Mines. You must also survive the hazards of the Warp Tunnel before you can confront the Dragon Lord himself.

Meridian III is available on disk for $29.95.

Check Reader Service number 410.

Word-Search Game

Sher-Tek Computer Systems (PO Box 6808, Station J, Ottawa, Ontario K2A 3Z4 Canada) has released Word Hunter for the Commodore 64.

Word Hunter is a family word-search game, appropriate for ages 10 and up. Players are given a specified amount of time to find words hidden in a matrix. The game includes widely varying challenge levels. Help and clue keys are also available to solve problems.

The package includes Generator programs that allow you to create your own new matrices. Word Hunter is available on disk for $14.85 and cassette for $9.95.

Check Reader Service number 411.

ATTENTION COMMODORE 64 OWNERS

We'll pay for your mistake!

We know that it's difficult, especially since everyone is trying to come out with one. Now that error track protection is going the way of the dinasaour, you probably purchased an obsolete piece of software. Well we will give you $25.00 credit*for any original copy utility software disk that you would like to trade in for the "NEW REVISED CLONE MACHINE." Our program can now back up non-standard sectors with complete control, detect and reproduce density-frequency alterations, alter the number of sectors on a track, sync to particular reference sectors (including a single sync Bit copy) PLUS reformat a single track.

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Unearthly Captors

Infinity Software (536 Curie Drive, San Jose, CA 95123) has introduced Escape, a text adventure for the Commodore 64.

You are held captive on an alien spaceship, guarded by robot sentries. Using your logic and problem-solving abilities, you must find a way to escape from your jailors. But be careful—the fate of the earth hangs on your every move.

Available on disk, Escape retails for $25.

Check Reader Service number 412.

Musical Keyboard from Waveform

Waveform Corp. (1912 Bonita Way, Berkeley, CA 94704) has introduced the ColorTone Keyboard for the Commodore 64.

The ColorTone Keyboard consists of a touch-sensitive membrane keyboard with 25 piano-like keys, a touch strip that performs as a musical harp and 14 function keys. Selections are made with the help of color pictures describing the use of each function key. The keyboard lets beginners play music in correct keys and tempos, choose different instrumental sounds and scales and play along with preprogrammed melodies without hitting dissonant notes.

Driven by the keyboard's accompanying software, the function keys let you choose any of eight different instrumental sounds; you can play along with 12 different preset background songs ranging from classical to "technopop." The program displays musical notation on a staff that scrolls by on the screen as you play. The keyboard can also be used with Waveform's MusiCalc software.

The ColorTone Keyboard, with accompanying software on disk, is available for $79.95.

Check Reader Service number 413.

Home Library

Prentice-Hall (PO Box 819, Englewood Cliffs, NJ 07632) has introduced the IMSI Home Library, a series of three software packages for the Commodore 64. The programs in the series are InfoManager, 4-Point Drawing Pad and Electronic Address Book.

InfoManager is a record management system that sorts, retrieves and updates information. Files, properties, stocks and other data can be stored on the disk.

The 4-Point Drawing Pad is a graphic sketch program equipped with four colors. You can create boxes, circles, ellipses and parabolas, and store them for later use. Drawings can be sent to a printer or plotter.

The Electronic Address Book maintains a file of your personal contacts. Information is filed, indexed and stored on disk, and any record can be searched. The program also allows you to print mailing labels and phone lists.

Each program in the IMSI Home Library series is available on disk for $39.95.

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- Built-in self-test with status report
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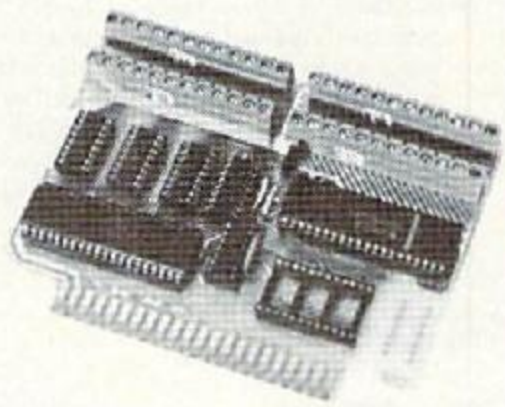

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Telecommunications System

TeleLearning Systems, Inc. (505 Beach St., San Francisco, CA 94133) has released Total Telecommunications for the Commodore 64. The package includes a modem and intelligent modem software, giving you access to over 50 databases.

The intelligent software allows for single-keystroke communications—sign-ons, protocols and codes are not needed. The software is menu-driven, featuring 300-baud auto dial/auto answer and auto log-on capabilities. It reads and downloads text, programs and data.

The package provides direct connection to 52 databases, covering news, sports, finance, science and medicine, education and reference materials. It also gives you access to other information services, such as The Source, CompuServe and Dow Jones. Retail price is $124.95.

Check Reader Service number 415.

Peek A Byte

Peek A Byte 64 is a disk and memory utility for the C-64, from Quantum Software (PO Box 12716, Lake Park, FL 33403).

The program features a track/sector and computer memory display and an editor with cursor control, allowing you to examine and modify disk sector data. You can read and write data to any sector on a disk.

Help screens are available with a single keystroke. Keyboard errors and disk read/write errors are reported. The program resides in high memory, and it won't lock up the computer. It is compatible with many Basic programs and the DOS Wedge 5.1.

Peek A Byte 64 operates with the 1541 disk drive (or compatible serial bus drive) and an optional serial bus printer. It is available on a copyable disk for $29.95.

Check Reader Service number 417.

New Disk Drive from Indus Systems

Indus Systems, Inc. (9304 Deering Ave., Chatsworth, CA 91311) has released the Indus GT disk drive for the Commodore 64 and the VIC-20.

The Indus GT is designed to handle all Commodore software. Features of the unit include: readouts that display track location, drive number and error codes; four AccuTouch buttons that control the digital readouts and electronic write-protect. The unit is housed in a smoked plexiglass dust cover.

Each unit is shipped in a molded plastic case that converts into an 80-disk storage library. Included with the drive is a software package featuring database management, a spreadsheet and a word processor. A one-year parts and labor warranty is also included. Retail price is $399.00

Check Reader Service number 420.

On-Court Tennis

Gamestar, Inc. (1302 State St., Santa Barbara, CA 93101) has released On-Court Tennis for the Commodore 64.

The game is designed to give you the visual perspective of the player on the court. You have full racket control over

for Word Processing *or* Graphics

... experience the XETEC family of printer interfaces

Available in three models — the SPI, SPI/B, GPI — These models feature a complete user's manual with software examples, command channels, an internal micro processor for maximum speed and intelligence, and an internal 2K buffer to allow more computing time (not included in the SPI). These models interface Centronics parallel compatible printers with the VIC 20, C-64 and SX-64 serial bus. The FONTMASTER, an optional software package, includes a word processor, 15 different type styles, plus a utility to create custom fonts.

SPI-SPI/B features:

- 2K buffer (SPI/B only)
- Centronics compatible
- 10 printing modes
- 10 additional commands
- 4 user-accessable switches
- CORRESPONDENCE QUALITY on the Gemini, Delta, Epson and Panasonic printers

GPI features:

- Standard 2K buffer
- Centronics compatible
- Graphic printer interface
- 7 printing modes
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groundstrokes (angle and spin), serves, lobs and smashes.

In the solitaire game, the skill level of the computer-controlled player varies according to your own skill. You can choose from three different playing surfaces: Grass (fast-paced), Hard Court (consistent) and Clay (slow-paced). You can also choose the length of the match.

The program provides four superstar challengers, each with his own particular playing style. If you beat the computer, you can join Gamestar's exclusive Top Seeds Tennis Club. On-Court Tennis is available on disk for $29.95.

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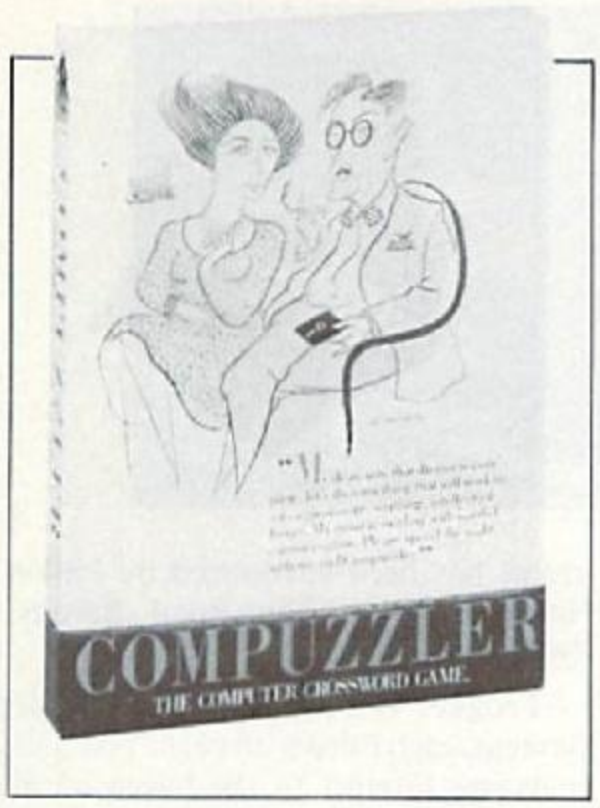

Software from Uptown

Uptown Software (310 Franklin St., Suite 339, Boston, MA 02110) has released Compuzzler, a strategy game developed from the traditional crossword puzzle.

The program generates a puzzle that must be filled in by competing teams. Up to four teams can play, each occupying one of the corners of the board. To branch from their respective corners, teams can fill in words either down or across. Clues are displayed at the bottom of the screen, below the puzzle grid.

Points are scored for each correct letter or word filled in. Each team can build only from their own words, leading to chains of words advancing from the corners. Teams can use blocking strategies and challenge their opponents' entries.

The game can also be played in a noncompetitive solitaire mode. Seventy puzzles (easy, intermediate and advanced) are included on the starter game disk. Additional puzzle disks are also available.

Compuzzler, with the starter game disk, is available for the Commodore 64. Retail price is $39.95.

Check Reader Service number 421.

New Editions of Northland's Taxaid Programs

Northland Accounting, Inc. (606 Second Ave., Two Harbors, MN 55616) has released new, revised editions of their Taxaid series of income tax preparation programs for the C-64 and the VIC-20. The new editions include all the latest changes in the tax laws.

Taxaid is designed for home use; the manual leads you step-by-step through data entry. Editing features allow you to make changes at any time during the data entry process. Data files can be saved and reloaded during any phase of the program.

Calculations are made automatically, and all tax tables (including income averaging) are built in. The program will prepare any IRS Form 1040. The results can be directed to the monitor or the printer.

Taxaid is available on disk or cassette for the C-64 and the VIC-20 (16K), with a retail price of $29.95. A smaller version (with fewer features) is available for the unexpanded VIC-20, with a retail price of $24.95. Updates for future tax years will be published yearly.

Check Reader Service number 419.

Simple IF

Proteus Electronics, Inc. (Spayde Road RD2, PO Box 693, Bellville, OH 44813) has introduced the Simple Interface System (Simple IF) for the Commodore 64.

The Simple IF card allows you to connect up to eight switches and eight loads (lamps, relays, etc.) to your C-64 to make your own light displays, security systems and energy controllers.

The card plugs into the C-64's expansion port. It includes data, sample programs and diagrams; operation is achieved through Basic commands or machine language. The following optional plug-in conditioning boards are also available for use with the Simple IF: an 8-input optoisolated board, an 8-output optoisolated board, a barrier strip board and a 4-position spst relay board.

The Simple IF card is available for $34.95.

Check Reader Service number 422.

Spelling Proficiency Program

Spell It! is a spelling proficiency program for the Commodore 64, from Davidson & Associates (6069 Groveoak Place #12, Rancho Palos Verdes, CA 90274).

Spell It! is appropriate for ages 10 through adult. It contains 1000 of the most commonly misspelled words. Four separate exercises are included in the program, each building up to the next. The final exercise is a spelling game that uses the spelling words covered in the previous exercises.

Spell It! also contains an editor, allowing you to add your own word lists and customize the exercises to suit your needs. The program is available on disk for $49.95.

Check Reader Service number 423.

New Printer Interface from Cardco

Cardco, Inc. (300 S. Topeka, Wichita, KS 67202) has released the Card/?PS, a universal parallel/serial printer interface for the C-64 and the VIC-20.

The Card/?PS can be used with any standard parallel or serial printer. It plugs into the serial bus port on the back of the computer or disk drive. The interface uses the standard Commodore Print format; software driver programs are not needed.

The Card/?PS includes all necessary cables for connection to a standard

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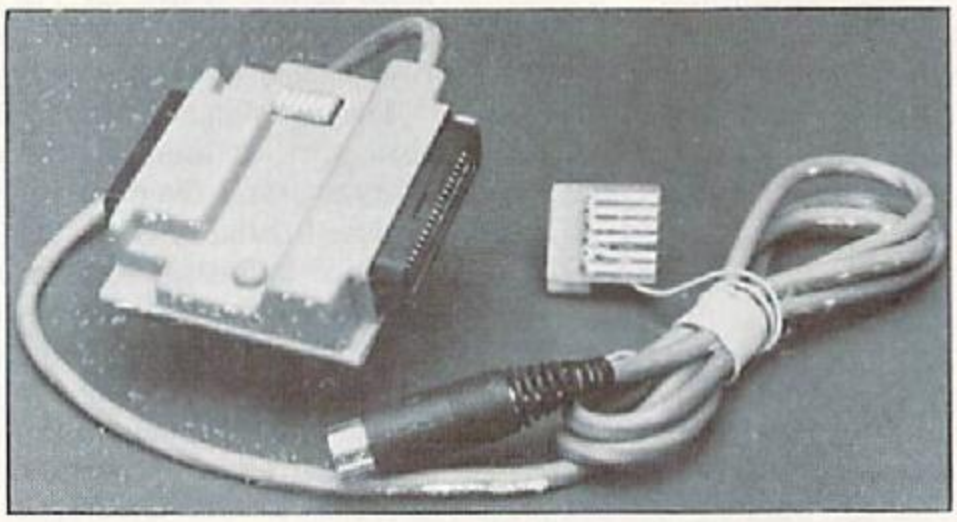

printer using standard parallel input. Retail price is $79.95.

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Threedeep in Danger

The release of Frogger II: Threedeep! has been announced by Parker Brothers (50 Dunham Road, Beverly, MA 01915).

Frogger II features three distinct screens, each filled with peril. You must navigate Frogger to the haven of his home bay. In the underwater screen, you must make your way through waters infested with alligators and barracuda, getting occasional help from a friendly giant turtle.

In the surface screen, Frogger's foes include swiftly moving sharks and very protective mother ducks. Poisonous black butterflies, Clyde the Dragon and a dangerous prop plane are Frogger's foes in the air screen.

Frogger II: Threedeep! is available for the Commodore 64 and retails for approximately $30.

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The Font Factory

The Font Factory is a printer utility program, compatible with the VIC-1525 and MPS-801 printers.

The Font Factory will read any standard Commodore 1541 ASCII sequential file. It will automatically format and print your document in any font desired.

You have control over all page formatting, such as page length, line width, left margin, top margin, line spacing, headers, footers, page numbering and justification.

Fifteen different fonts can be mixed within a single document. Thirteen commands are available for reformatting text. Eight preformatted fonts are provided, including one with true lowercase descenders.

The Font Factory is available on disk for the C-64. Retail price is $29.95. Micro-W. Distributing, Inc., 1342B Route 23, Butler, NJ 07405.

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COMING ATTRACTIONS

■ **Cover Story** The results are all in; the votes have been counted; and the winner is.... Next month we will announce the winner of the recently completed joystick contest, in which readers voted for their favorite joystick. You'll find out which joysticks are the most popular among our readers and examine the features of the various joystick entrants.

In addition, the February issue will also feature several joystick-related articles, including:

—how to repair a broken Commodore or Atari joystick after it has lost its fire power and movement control.

—how to speed up joystick routines and how to program a joystick routine into a game.

■ **A Taxing Situation** Just in time for getting your tax records in order for the April 15 deadline, *RUN* will present Tax Records 64. Just load this program into your C-64, and tax day will be a lot easier, and perhaps cheaper, to face.

■ **You're It!** This long-time favorite children's game takes on a new dimension in the computer version. Tag lets you and a friend chase each other around the screen; when you're tired of running, this colorful program provides hiding places where you can catch your breath.

■ **Spotlight on Productivity** This series on the built-in software for the Plus/4 continues. The Spreadsheet, which can be combined with the word processing and graphing programs, lets you prepare financial and budgeting reports for home or business.

■ **Anagram Program** How good are you at unscrambling words or phrases? In this word game, you must decipher a computer-scrambled word or phrase entered by your opponent. Points are awarded based on the length of the word or phrase and the number of tries taken to correctly unscramble it.

■ **Fly the Grand Canyon** Barnstorming action at its best. For the VIC-20.

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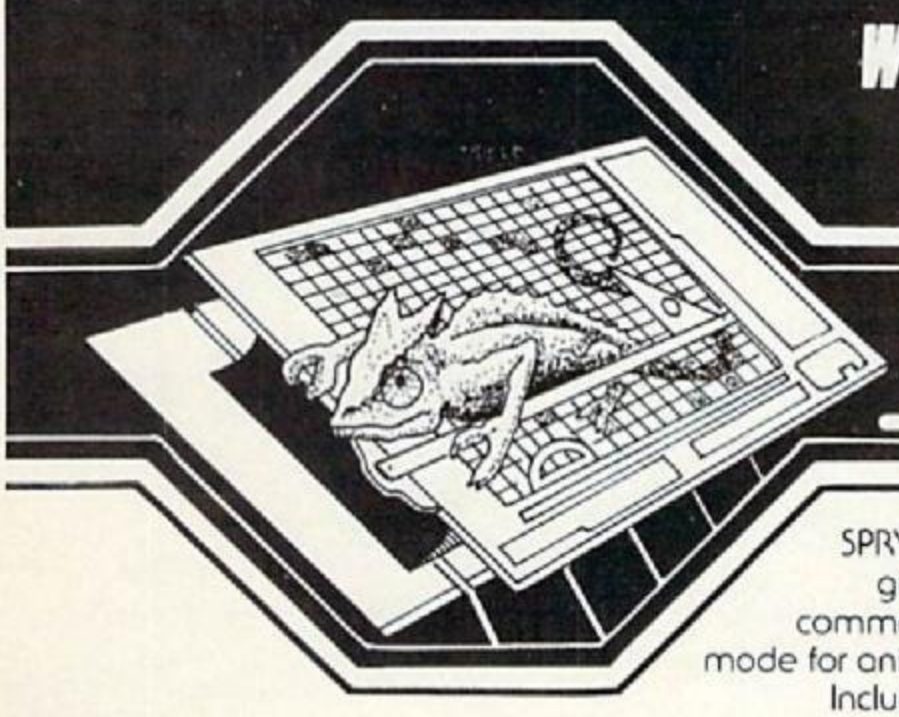

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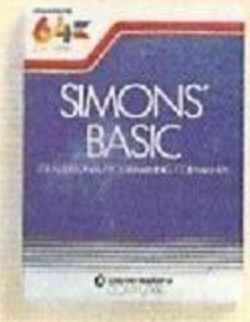

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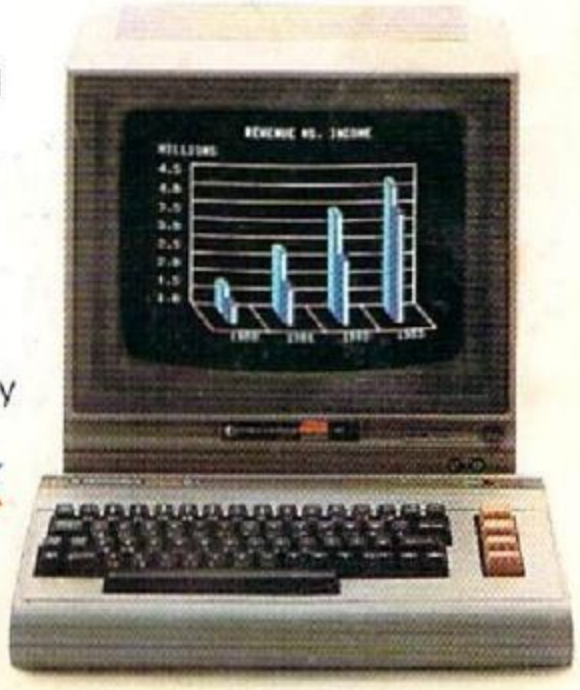

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